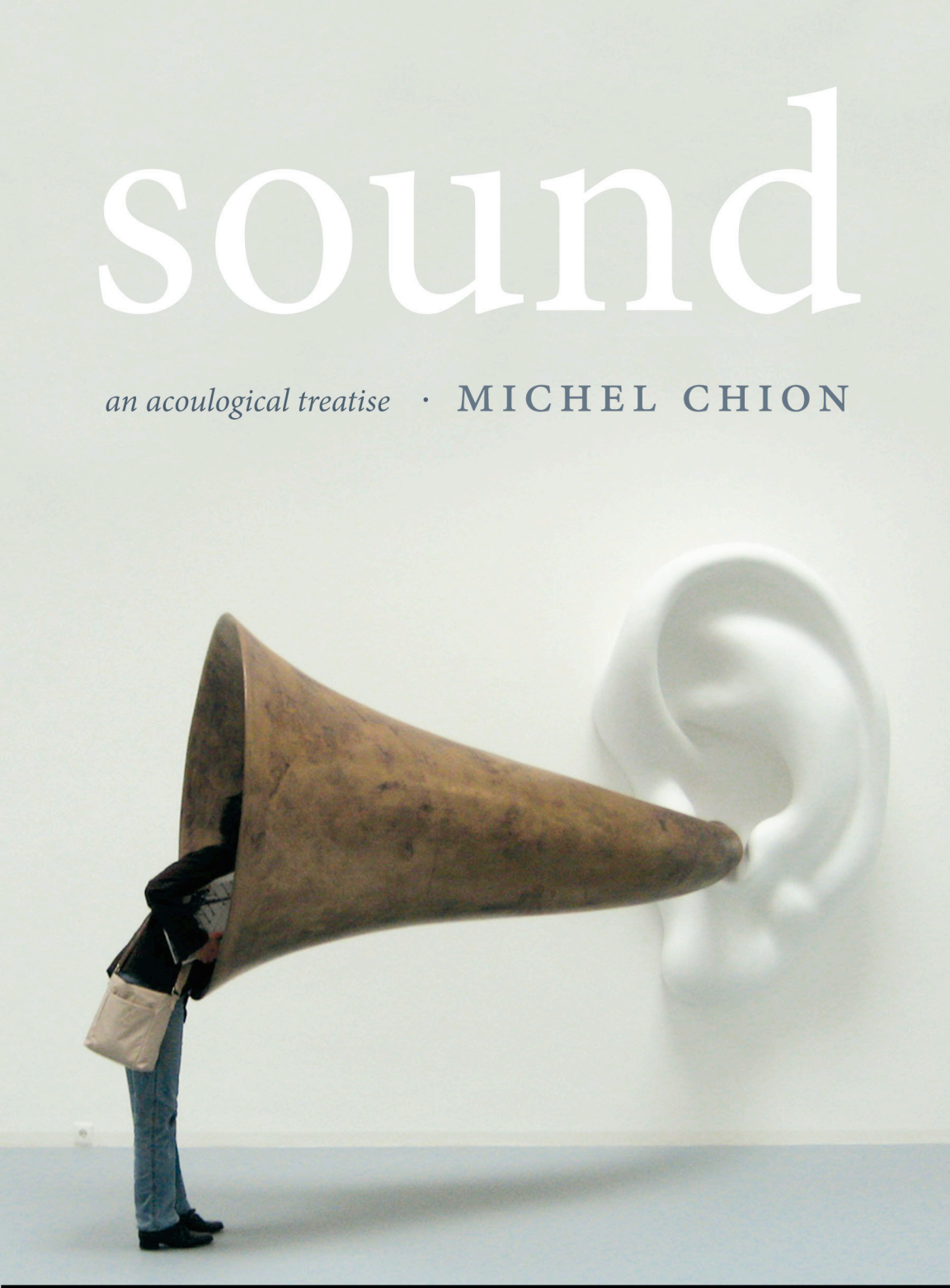
sound

an acoulogical treatise · MICHEL CHION



TRANSLATED AND WITH AN INTRODUCTION BY JAMES A. STEINTRAGER

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Introduction

Closed Grooves, Open Ears

JAMES A. STEINTRAGER

The first thing likely to strike the reader about the book translated here is the emphatic generality of the title: sound, simply. Yet while the author is certainly interested in an inclusive approach, he is not after blanket statements or universal declarations. He is in pursuit of particularities, multiplicities, and the often uncertain borders both around and within the sonic domain. Take the case of music, one region of sound that understandably receives ample attention in the following pages. Seemingly our most organized and intentional sonic intervention, music would simultaneously be guided by universal physical and mathematical laws. But what if we turn to the *matter* of music? What happens, for example, if we attend to timbre, that generally unnotated and in most respects unnotatable bundle of characteristics that makes a given type of instrument and sometimes even a specific instrument recognizable as such? Or what happens when instead of assuming a fundamental difference between music and noise, we question the legitimacy of this distinction between sound regions and concentrate on—rather than ignoring or repressing—the surreptitiously musical role of fingertips scraping along a fret board or the guttural sputtering in and of a human voice? What happens if we do not approach music as the least representational and most abstract of arts? If we suspend the notion of music as an aural mathematics, a conception not limited to the classical era and one that, on the contrary, marks many modern and postmodern compositional schools such as serialism, microtonal music, spectralism (which applies mathematical analysis to timbre rather than pitch), German *elektronische Musik*, and even practitioners of the aleatoric? What if we follow instead the path of music forged from material mined from the ambient sound world? And what if it turns

out that the so-called laws of tone are regularities rather than universals at the extremes and that these extremes are only so to human ears? And when the gut vibrates with a rumbling bass rather than ossicles intelligently tapping out melodies and harmonies within the ear, are we still in the realm of sound at all, or have we passed over to a different, perhaps yet unnamed, sense? Why or why not?

These are some of the questions that Michel Chion ponders and for which he provides some provisional answers in *Sound*. And he hardly limits himself to music. The Anglophone reader most familiar with Chion as one of most subtle and engaging theorists of film as at once a visual and a sonic medium—a medium of audio-vision to employ his coinage—will find elaborations and systemizations of insights found in translated works such as *Film, a Sound Art*, *The Voice in Cinema*, and other writings.[1] With Rick Altman, Chion has been both a pioneer and an ongoing critical presence regarding the need to take sound in film seriously and the tendency to privilege the visual. Along with music and so-called sound effects, film is also a vocal art, providing one of many manifestations of the human voice that Chion considers: from the arts of drama and poetry to cocktail party conversation. He also examines sounds of everyday life, from the feedback loop created when we listen to subtle sonic gradations as we pour a liquid into a container and adjust our motions accordingly to the global diversity of "soundscapes"—to use R. Murray Schafer's evocative portmanteau, the pertinence of which Chion thoughtfully probes—and on to the beeps, buzzes, and assorted signals of our latest technological companions.[2] Then there are reflections on and interrogations of other differentiations within sound: live versus recorded, in situ versus broadcast, digital versus analog, and so forth. A book simply about sound, then, turns out to have complexity at its core. Soon enough, we are not even sure what sound is or, to put the matter more philosophically, what its ontological status might be.

To grasp why such philosophical terminology is apt, we must examine some of the cultural and historical factors that have shaped Chion's guiding questions and concerns. These factors include innovations in media and communications technologies, as well as specific institutions and somewhat more vague milieus, for instance, the "French musical establishment." Chion himself invites considerations of the sort insofar as he dedicates ample analysis to his crucial forebear Pierre Schaeffer and to the latter's ongoing indispensability for thinking about sound. Schaeffer may not be a household name in the Anglophone world, although he will be familiar to those inter-

ested in the history of electronic music and in contemporary composition. He was the instigator of one of France's most distinctive postwar contributions to both: musique concrète. In 1951, he created an institutional home for the latter in the Groupe de recherches de musique concrète [Research group for musique concrète], subsequently transformed into the Groupe de recherches musicales [Group for Musical Research (GRM)], which, along with Pierre Boulez's Institut de recherche et coordination acoustique/musique [Institute for research and coordination in acoustics/music (IRCAM)], was a center of musical innovation in postwar France and continues its work of support, experimentation, and dissemination to this day.[3] Over the years, the GRM's membership has included key composers of electroacoustic music such as François Bayle and Bernard Parmegiani, along with younger practitioners such as Lionel Marchetti, and during his formative years, Chion himself, who has long been a practicing composer of musique concrète. As for musique concrète, in Schaeffer's initial formulation, the composer in this genre starts with sounds recorded from the environment (generally referred to as field recordings today) or simply with recordings of various sounding objects (although not usually musical instruments, unless treated along lines now labeled "extended techniques," for example, the clicking of valves on an unblown trumpet or striking its bell with a mallet). He or she subsequently arranges and otherwise manipulates such material to produce, hopefully, something worthy of the name music. One of Schaeffer's earliest and most famous examples is his *Étude aux chemins de fer* (1948), in which train whistles and the chug of steam engines are shaped into a short composition. Could anyone really turn such sonic base matter into musical gold? It was not simply reactionary naysayers within the cultural establishment who posed the question. Rather, the success or failure of his studio alchemy exercised Schaeffer as well, and, having opened the gambit with his early experiments, he wondered if there was "a case for seeking out a new sound domain on the borders of music" or, contrariwise, whether "these new concrete music materials, presuming they finally become more malleable," should simply be "incorporated into a musical form."[4] Ultimately, Schaeffer suggested that the processes and procedures of musique concrète could engage dialectically with traditional composition or that at least the two could become mutually informative.

Schaeffer's hesitance is understandable. After all, what "concrete" music set out to do was to stand composition as traditionally understood on its head. Rather than starting with the abstract—with music transcendentally

and immaculately conceived before being notated and finally materialized in performance—the starting point would be real. The composer would begin with the immanent properties of actual sonic material and thus with material often bearing an uncertain relation to tonality and its laws. The givens of composition, including the ongoing reliance on precise pitch in so-called atonal music, could no longer be assumed. Of course, what Schaeffer was articulating both conceptually and in sonic practice were some of the possibilities of new media of capture, replay, and manipulation. He did with phonographic recordings and magnetic tape what is more often and more easily done at present with digital technologies, and from phonographs and tape he drew his thinking, so to speak. Now sampling is firmly established practice, and not only in popular music. Audio processing of multiple sorts is ubiquitous: compression, clipping, all manner of frequency-domain modifications, and so forth. The adjective "electroacoustic," often applied to real-time processing of sounds emanating from traditional instruments, is not a shocking amalgamation, as when Schaeffer employed it, but an accepted, even common, way to make music.

At this point, we could trace some intriguing genealogies. For example, Pierre Henry, one of Schaeffer's earliest pupils and collaborators, not only would go on to release important compositions in musique concrète but also would adapt the latter's techniques to popular music with the short composition "Psyché Rock" (1967) and a subsequent collaboration with the progressive rock band Spooky Tooth on the LP *Ceremony* (1969). The former was originally part of a dance suite composed at the behest of the choreographer Maurice Béjart and a collaboration with the composer Michel Colombier. In a nod to electroacoustic innovation and thanks to the catchy, simple, repeating chord progression on which it is built, the single has been remade and remixed multiple times, including thirty years after its initial release by the British DJ Fatboy Slim, also known as Norman Cook. As for *Ceremony*, while not innocent of the excesses and sonic bombast of much "prog," the album helps recall just how much cross-pollination between classical, avant-garde, and popular music took place in the late sixties and early seventies, with new technologies often a motivating factor.[5]

As the possibilities of sonic intervention have multiplied and become accepted as natural facts, the question of the boundaries of music has never gone away. If anything, the general availability of digital technologies of recording and manipulating has motivated and augmented the number of those who embrace the moniker "sound artist" and by implication reject the

label "musician" as inapposite and even antiquated. What once might have rung sarcastically now figures capaciousness, openness, and difference. Let us take this as a sign that we are still in the era that Schaeffer helped inaugurate and about which he carefully thought. One of Chion's aims in *Sound* is to rethink, extend, and complicate his own—and our—belongingness to Schaeffer's world, and in this regard there are two essential Schaefferian terms and concepts that we must grasp: the "acousmatic" and the "sound object." Both are related to specific, material media of sound reproduction and transmission, or what in French are often called *supports*. "Acousmatic" refers primarily to a sound the cause of which remains unseen. Within film studies, Chion's writings have already made the term somewhat familiar, along with his *acousmêtre*, a being that exists as voice alone.[6] A notorious example of such a sonic being or nonbeing is Norman Bates's mother in Alfred Hitchcock's *Psycho* (1960).

When Schaeffer revived the term "acousmatic," he emphasized its ancient provenance and pedigree: traced to the Greek philosopher Pythagoras, who supposedly taught from behind a curtain, sensually speaking reduced to a voice alone.[7] In Schaeffer's account, this somewhat contrived pedagogical and philosophical position figures a desire to concentrate the pupil's attention, although we might note a certain mystifying potential as well. For Schaeffer, however, new media technologies had introduced acousmatic listening as an increasingly normal and, in fact, inevitable listening position. Central in this conceptual universe was the broadcast medium of radio, which would have been much on Schaeffer's mind and a significant aspect of his institutional reality.[8] Starting in the late 1930s and throughout the time he was formulating his theories and producing much of his experimental music, he worked for Radiodiffusion Française (later Radiodiffusion-Télévision Française [RTF]), the studios of which also provided many of his tools and toys. Radio sounds evidently had no equivalent visual component—images were not broadcast alongside music, voices, or other sonic content—which does not mean that the medium was not embedded in various ways in regimes of visuality.[9] In this regard, one of the charges of both sound engineers and vocal artists working in radio was to provide material and cues for visual conjuration.[10] This charge of encouraging the imagination of sonic sources, causes, and scenes still exists, although probably to a much lesser extent than initially, when, for example, radio dramas were common. On the other hand, conceived as an invisible or rather a-visual medium, radio suggested another route: the pursuit of sounds in themselves, severed from sources

and the very materialities on which musique concrète as precisely concrete had taken off. As Schaeffer wrote of his own early compositions and the matter from which they were built, what he was undertaking was an "effort to abstract the noise from its dramatic context and raise it to the status of musical material."[11] For Schaeffer, the conjuring ability of sounds might be, in other words, erased, repressed, or, in a word, processed out of existence; from concrete sources, something like perfect sonic abstraction might be reached. Notwithstanding, we can easily grasp why the medium of radio was conceptually so important. Ironically perhaps, it was the conjured *radiophonic scene* that above all offered up the acousmatic for contemplation and figured a generalized, mediated return to Pythagoras's putative pedagogical curtain: an armchair listener with ear cocked to a speaker from which emanate disembodied voices.[12]

Following Schaeffer, Chion claims as a general fact about technological media of sound reproduction per se that they place the listener in an acousmatic position and this regardless of any particular format. He remarks, for example, that although acousmatic situations were "certainly not new when telephone and radio were invented," "the radio, telephone, and recording systemized the acousmatic situation and provided it with a new meaning by dint of insinuating it automatically and mechanically" (see chapter 9). Phonographs, tape, compact discs, and MP3s all seem to isolate sound from vision; they thus belong together in the same way that live opera, music videos, and most films do, granting that these latter media nonetheless link sound and vision in diverse ways.[13] More important—and in a tautological formulation that has crucial implications—original sonic *causes* are not visually available or visually implied with media restricted to sound reproduction alone. In this regard, Schaeffer's other concept—the "sound object"—has an intriguingly ambiguous relationship to technical mediation and causation. Indeed, it might be said to *take off* from both, in the sense that it emerges and then liberates itself from them. Although best understood as a perceptual or even conceptual unity abstracted from the conditions of actual production in Schaeffer's elaborated formulations on the topic in the sixties, the "sound object" was early on epitomized in what otherwise might seem a technical malfunction: a phonographic stylus tracing not an ever-tighter spiral but a circle, stuck in a closed groove and thus repeatedly reproducing the sonic information impressed on the format. Prior to the possibility of recording, sound was necessarily an event, and this entailed its uncertain ontological status. As opposed to a visual or tactile object that stands against

us and perdures, sound was quintessentially ephemeral. These conceptualizations of sound are certainly debatable and can be negated in various ways (watch the flow of a liquid, for example). Still, technologies of recording or "fixation," to use Chion's preferred term, do seem to have introduced new possibilities for relating to sonic temporality. With the closed groove, tape loop, or simply the ability to hit rewind or replay, time is not exactly mastered or irrelevant, yet repetition for Schaeffer makes the *sound object as such perhaps possible for us*. Before examining why this formula is tentatively put, I should note once more that contemporary musical practice seems to follow Schaeffer's thesis in certain respects: not only has the use of loops become commonplace, but popping and scratching of vinyl records has produced sound objects that are put into play rather than treated as errors or flaws, and digital "glitches" may likewise serve as starting points for composition and improvisation.

The concepts of the acousmatic and the sound object are complementary. Together they allow for an abstraction of sound from the visual or, better, the linked isolation of listening and sonic phenomena. We might here recall Descartes, mentally stripping away the accretions of Scholastic philosophy to get to first principles, as he sits in his chair by the stove, eyes closed and manipulating a piece of wax in his fingers. Instead of focusing on the haptic sensations of mass, volume, extension, and texture, however, our ideal listener, perhaps outfitted with headphones, is fixed on their aural analogues. This would give us a Schaefferian construct that we might call the auditory original position. Like the wax in Descartes's hand, once the sound object, first imprinted on wax cylinders, comes to be, it can be turned over in the listener's mind and further manipulated in theory. With the aid of acousmatic listening, this object can be experienced for its intrinsic properties and is no longer bound to extrinsic ones such as instrument, source, or intent. Yet if media such as radio, tape recorders, and phonographs provide context, impetus, and means for Schaeffer's practices and conceptualization, we must recognize too that the latter in particular were shaped by one of the dominant trends in early to mid-twentieth-century philosophical thought: phenomenology.[14] In his mature theorization of music and sound, Schaeffer makes explicit reference to Edmund Husserl, who self-consciously returned to Descartes's experiments in doubt and building up from first principles. Husserl's philosophy begins with a suspension, or *epoché*, of all but phenomenal experience. We are also reminded that Maurice Merleau-Ponty, another avatar of phenomenological method to whom Schaeffer refers, was

one of the crucial figures in French philosophy at the time the latter was formulating his notions of musique concrète.[15] Finally—and compressing a couple hundred years of complex epistemology into a sentence or two—phenomenology was an extension of the Kantian critique of pure reason. This critique put access to *noumena* or things-in-themselves off limits. At the same time, it attempted to bypass the same by focusing on what could be derived purely from *phenomena*, regardless of any conjectural underlying reality or cause.

Schaeffer's conceptual apparatus has profoundly informed Chion's work on sound. This includes—but is certainly not limited to—the two key notions of the sound object and the acousmatic. Chion adopts as well an enduring distrust for considerations of cause. To *really* listen to a sound entails ignoring or bracketing, insofar as possible, where that sound comes from, what makes it, and why it exists at all, because such inferences tend to prejudgment, distraction, and distortion. This is particularly true for that pedagogical-cum-ethical mode of listening, evidently related to the acousmatic as a sort of ideal, that Chion, following Schaeffer, calls "reduced listening." The label describes the type of listening where the sound object is considered only in itself and not for what it might, for example, signify or whence it might come. The choice of terms is not accidental: the phenomenological notion of *reduction* entails a similar bracketing. This distrust of causes is presumably why Chion prefers "fixation" to the more usual "recording": the former term emphasizes the sound object, which *comes to be* through fixation; the latter draws attention to the cause or original instance of a sound, of which the re-cording or re-sounding is semantically and cryptically stained as derivative, a lesser repetition of a sonic event rather than a sonic object in and of itself.

In his distrust of causes and how they may lead the listener away from sound as such, Chion inherits from Schaeffer what we might call the temptation of sonic purity or immaculate audition. At the outset, this might be explained as a social defense mechanism of musique concrète. When your sources are deemed suspect, noisy, clattering materials rather than, say, a perfectly tuned, well-tempered piano, an instrument with the imprimatur of the musical establishment, the composer working with the former might shift the blame to the critics. The problem becomes not the impurity of the sources but the closed mind and thus the closed ears of the institutionally molded listener. The temptation of sonic purity notwithstanding, what ultimately interests Chion are the difficulties of this ideal: everything that

makes the ontological status of sound objects unsure and, concomitantly, everything that informs our listening. Part of the sound object's refusal, so to speak, is produced because there is no sound object without a listener. This should not come as a surprise. After all, no one but the most committed idealist doubts whether the tree in the forest falls, but whether it makes a sound. We accept or at least intuitively comprehend the inherent subjectivity of sound. For another thing, we tend to analogize sound to other sensual registers—sight above all—and so miss or distort what is specific to sound objects. But beyond this, it is unclear whether even when grasped in its specificity, the so-called sound object really ever attains an objective status. As Chion puts the matter early on, when we approach the sound object, we immediately get off to a bad start. By this, our author suggests the sound object's fundamental or essential malformation, at least if we stick to our usual notions of what makes an object. As it turns out, however, getting off to a bad start means getting off to a good start. The object's resistance—its very oddness—tells us something; it serves as an entrée to deeper questioning and complexities.

Approaching the Sound Object: Theory, Practice, and Pedagogy

The territory that, in Chion's account, Schaeffer discovered and began to map is the one that our author continues to explore, all the while redrawing and questioning its internal and external boundaries. This means that we need not endorse or embrace every aspect of Schaeffer's conceptual world to follow Chion. Indeed, we might say that he is committed both to the phenomenological project and to its simultaneous, ongoing disruption: unearthing and thoroughly examining what sunders, distorts, or simply makes the purity of sonic experience and the unity of the sound object impossible. Early on in *Sound*, we come across the infant, who, prior to speech and thus not yet initiated into the structuring effects of language on the senses, seems to enjoy access to an unmediated, full, and present experience of sound (much like the angels who can hear the music of the heavenly spheres). Language in this instance represents a fall. It darkens or "scotomizes," to use one of Chion's favorite terms, borrowed from psychoanalysis and the visual register, our access to sound. Yet language is for the most part positively valued in Chion's account. We can learn from poets, who not only have thought deeply about sound but also have put sounds into vocal play. *Sound* begins with lines from Racine, moves on to Victor Hugo's rich sonic evocation of a Guernsey morning, experienced acousmatically by a just-awaking listener,

and has us consider lines from Mallarmé and Rilke, as well as haiku (in which I might add that the sonic *kireji*, or "cutting word," is a crucial, structuring component). But this emphasis on language is not restricted to poets or to the spoken word. Thus Proust's distinction between the front gate bell and the back gate rattle in *In Search of Lost Time* becomes a motif in Chion's book. The novelist's descriptions help us differentiate sounds and, in this case, grasp how they are interwoven with social signification: the resounding bell announces relative outsiders to the family circle; the tight, buzzing rattle the return of insiders. But it is not only those wielding creative insight, as it were, to whom Chion turns. Everyday language also yields sonic insights, and perhaps the most important ones. It guides our listening, shapes and obscures it, but also serves to open our ears.

This takes us to what I would call the constructivist linguistic and cultural thesis that runs throughout *Sound*. The philosopher and historian of science Ian Hacking has argued that the notion of social construction has become so ubiquitous as to be potentially meaningless until further specified. He also offers a range of constructivist commitments. These go from historical and ironic, the weakest commitments, to either reformist or unmasking, and on to the strongest degrees: rebellious and finally revolutionary.[16] While Hacking proposes these as levels of commitment, I would submit that his categories or positions are hardly mutually exclusive. One might be, for example, a suspicious or radical historicist or an ironizing unmasker. As for Chion, his constructivist commitment appears moderate but insistent. He knows that there are ears, brains, vibrations, and waves with heights and widths subject to measurement and analysis. Still and more interestingly, there is much that we bring to these objective givens, including cultural and linguistic prejudices *and* guideposts. He has no doubt that different languages and various cultures of listening divide up and make us attend to sound in different ways. An important example of the linguistic hypothesis is the French word *bruit*, for which "noise" would be the usual dictionary translation. Chion is eager to demonstrate that this easy equivalence is misleading. First, take an example of English usage: the sound of the neighbor's footsteps in the hallway might be a fact or even a comfort; the noise of his footsteps must surely be a bother or even a threat. In French, this distinction is blurred because of the tendency to use *bruit* instead of *son* for both such circumstances. In other words, in French usage *bruit*, with its negative connotations of disturbance, takes up part of the Venn diagram that English tends to annex to the more subjectively neutral "sound" (*son* in French and the title word

of this book). The author explores what he deems the consequences of this usage at length, and there is no reason for me to repeat or summarize his analysis. What I wish to underline is that for Chion ordinary language is not wholly innocent. It is linked, however unconsciously, to mind-set and attitude, and it covertly molds the listener and listening. For this reason, I have usually indicated in brackets whether *son* or *bruit* is employed in the original. This is the sort of obtrusion usually avoided in translations, but it serves here to draw attention to—and concomitantly to not repress or render invisible—linguistic difference. Comparing French and English usage also helps us better understand a number of related questions that Chion addresses. For example, how do we distinguish between a "noise" and a "sound"? Is this distinction inherent or imposed? If the latter, how is it drawn, who perhaps draws it and to what ends? Similarly, is the difference between "noise" and "music" culturally or linguistically conditioned? How do we deal with "noise" within "music"? It turns out that cultural-linguistic distinctions are interwoven with social, institutional distinctions in the sense put forward by Pierre Bourdieu: matters of language and matters of taste, institutions, class, and politics are, in the final analysis, inseparable.[17]

Chion's concern for language means that the usual translation issues such as the difficulty of capturing connotations, nuances, and the pluralities of possible meaning often enveloped in a single word are frequently exacerbated. Yet these apparent problems turn out to be useful complications, heuristic and revelatory. To take an example, I have used "intensity" to denote changes in perceived loudness, that is, perception of wave amplitude, in preference to the more usual English term "volume." I have done so not only because "intensity" is obviously cognate with the French *intensité* and not only because it more readily connotes strength and weakness, but also simply because Chion, following Schaeffer, tends to use "volume," along with "density," to describe that aspect of the perceptual field that they label "caliber." "Volume" in this latter usage is not a matter of strength but rather of a sonic substance or capacity—or at least of capacity as figure for certain sonic features. Of course, a linguistico-cultural constructivist might argue that the English use of "volume" links perception of wave amplitude intrinsically to notions of sonic capacity (although a Wittgensteinian might counter that ordinary usage conjures nothing of the sort, and the encounter between the two positions might itself be instructive). There are thornier cases as well, created by the inherent, often allusively rich and instructive, polysemy of some terms. Consider *allure*, which can mean "speed," "pace," "look," or

"bearing." I have chosen the latter, but clearly not without risk of semantic loss.[18] Schaeffer describes *allure* in his summative *Traité des objets musicaux* [Treatise on musical objects] (1966) as a formal quality of sounds that "evokes the dynamism of the agent and kinesthetic sense," and Chion has glossed the term elsewhere as referring to "the oscillation, the characteristic fluctuation in the sustainment of the certain sound objects, instrumental or vocal vibrato being examples."[19] The reader wanting a more concrete notion might listen to Schaeffer's composition *Étude aux allures* (1958) and try to hear what is at stake.

When the sound of words is part of their significance and, indeed, signification, these issues are compounded. In such cases, providing the original French and occasionally other languages in conjunction with English glosses is necessary. This is most obviously the case with onomatopoeia, where the goal is to underline phonetic distinctions between, say, an American cat's "meow" and a French *miaou*. Chion suggests that attending to differences in such descriptive terminology and bilingual journeying yields food for thought and attunement for our listening. What language does, or can do if we attend to the distinctions both sonic and conceptual that it makes, is to turn us into more nuanced second-order auditory "observers": listeners to our listening and more articulate describers of the same. Examination and attention to the various ways that different languages intersect with the sound world open up new possibilities of listening and heighten awareness of what might be called our naturalized linguistic positioning within it. This attuning power helps explain Chion's general preference for linguistic articulation over notation in spite of his adherence to the symbolic marks that Schaeffer set forth in the *Traité des objets musicaux* for general categories of sound: N for tonic sounds, X for continuous complex sounds, X' for complex impulses, and so forth. The use of such marks harkens to a certain positivist strain perhaps best expressed by symbolic logic in the Anglo-American tradition and in France by structuralism, including Lacan's otherwise idiosyncratic obsession with mathematical-looking formulas, graphs, and the like. Schaeffer himself, however, prior to formulating his mature categorization of sound objects and their characteristics, wrote at the outset of his explorations that having sketched and preliminarily notated a "draft structure," "it would be easy to yield to the temptation of paper, which is contrary to the spirit and the method, and even the potential, of concrete music."[20] Notation only truly covers parts—and quite partially—of the traditional four aspects of music in Western theory. These aspects are pitch, marked as notes,

of course, and that can at least be tied to "reality" in the form of frequencies; duration, from conventionally determined beats per measure to vague markers such as *allegro* and *adagio*, and in any case shifting and modulating rather than metronomic even in the case of the Western classical tradition; intensity, with highly relative dynamic terminology such as *pianissimo* and *mezzo forte*; and finally, timbre. The latter is a category that Chion considers hopelessly vague and which the Schaefferian system is meant to supplement or replace. In Western notation, beyond specifying what instruments are to be used, the matter of timbre is almost nonexistent, with the exception of some indications of attack: staccato marks, pizzicato indications, and so forth.[21] For Chion, symbolic notation may appear to be or at least promise to be exhaustive and almost scientific. It is neither. Further, it misleads us into judgments of what is worthy of capture and therefore worth our while as listeners. Language would seem an odd preference, however, since surely terms such as *sforzando*, *smorzando*, or *perdendosi*, let alone onomatopoeias such as "creaky" or metaphors taken from other sensual registers such as "bright," remain vague. This weakness or fuzziness turns out to be a strength: words draw attention to their poverty, to their lack; even as sonic matter, when spoken or heard, they do not imitate, indicate, or figure perfectly. We might say that it is precisely their failure that draws us closer to sound, forcing our attention and honing our discriminatory and descriptive powers.

This helpful fuzziness might be seen as deconstruction in action. And in spite of—and really because of—the temptation of auditory purity, there is a deconstructive strand that runs through *Sound*. Already noted are the difficulties of linguistic representation and the inevitable play of language. It is striking how frequently sonic descriptions rely on other sensual registers—sight, first and foremost, although touch contributes significantly as well—and lend an inevitable figurativeness and instructive slipperiness to the sound objects we attempt to grasp and describe. What exactly is a clear sound or a rough one? More technically, Chion reaffirms one of the core theses of structural linguistics: Ferdinand de Saussure's claim that spoken languages carve up sounds into systems of oppositions. Saussure figured this division visually as the carving up of a continuum. Once it is carved, moreover, speakers of different languages can be said to hear otherwise from each other. For example, while the difference between sounds represented in English by the consonants "ı" and "r" can be described according to the physics of sound as well as anatomy, for the speaker of Japanese, where this opposition is *insignificant*, hearing the difference may not be possible. The difference

is scotomized. Similarly, the vowel sounds represented by "u" and "ou" in French or "u" and "ü" in German do not have equivalents for the Anglophone. Jacques Derrida began his deconstructive project by applying Saussure precisely to Husserl's phenomenology. The voice that would re-present phenomena and phenomenal experience for the subject within the *epoché* is itself a tissue of differences and absences.[22] Chion explicitly refers to Derrida's critique of Husserl, reiterating his analysis of the ineluctable reflexivity of the voice, encapsulated in the expression *s'entendre parler*. This can be more or less rendered "to hear oneself speak," although reflexive constructions come more readily to French. Further, the verb *entendre* means both "to hear" and "to understand"—not to mention suggesting the phenomenological notion of intentionality—uniting sound and cognition in a neat bundle that Derrida is keen to untie. That we hear ourselves speaking divides us from self-presence even as it holds it out as a promise. Ultimately, though, it is one of Derrida's later coinages that comes to mind to describe Chion's project: "hauntology."[23] Relieved of its portentousness, this seems an apt term for a science of sound objects that never fully cohere as such and for considerations that take off from musique concrète. After all, the latter begins with an actual sound source in the world and, while perhaps distorting it beyond recognition, nonetheless registers a ghostly trace of this quasi object's "being" as event, moment, and passage.

The affinities between *Sound* and deconstruction, beyond their clarifying and suggestive functions, may lead us to ponder Chion's relation to that set of academic discourses that often goes simply by the name of "theory" and that was predominantly a French import into literature departments—along with a host of other disciplines, including film studies, women's studies, and anthropology—in the 1970s and 1980s. Much has been written about the so-called theory boom, its institutional history, its critics, its diminishing influence and ongoing relevance.[24] Some of the key names of theory such as Derrida and Lacan, either explicitly or allusively, and crucial forebears such as Saussure and Roman Jakobson have significant roles to play in Chion's considerations. Yet the reader who wants to class him as belonging to theory—either positively or negatively valued—will have a difficult time doing so categorically. Of course, this does not mean that his work is not and has not been amenable to more evidently theoretical investigations.[25] While Chion comes out of a French intellectual context at a time when theory was a given, he was also informed by different sets of institutions and institutional concerns and conceptualizations. This is why I have thought

it important to introduce *Sound* not with the familiar names of theory for the Anglophone academic reader but rather with Schaeffer and musique concrète. If we are looking for contextual fit, then a name such as François Bayle makes equal if not more sense than Derrida. A major figure in French music in his own right for several decades now, Bayle was an early disciple of Schaeffer, as well as a student of Olivier Messiaen and Karlheinz Stockhausen, two pillars of twentieth-century composition. He took up the director's position of the GRM in 1966, oversaw its linkage to the Institut national de l'audiovisuel (National Audiovisual Institute [INA]) in the midseventies, and directed the INA-GRM for two decades. Bayle, who has composed in the genre of musique concrète, has also laid out a theory of *i-sons* (i-sounds) or *images-de-sons* (sound-images) that resonates with Chion's elaboration of the phenomenological "sound object."[26] Chion himself indicates the parallel, albeit not without pinpointing the potentially misleading visual analogy. Similarly, Bayle has followed Schaeffer's path in founding and forwarding the conceptual project of "acousmatic music," as well as creating his Acousmonium, a multispeaker sound system, to support it. There is no reason to paint Chion within narrow institutional confines, however, and his work—to borrow the title of a collection of his essays—has been that of a strolling listener: nondogmatic, eclectic in its sources, its impulses, and, it must be said, its criticisms. The reader of *Sound* will thus come across considerations of Alfred Tomatis, the pioneering and controversial speech and hearing therapist; Robert Francès, psychologist and author of *La perception de la musique* [*The Perception of Music*]; and many other figures from various disciplines and domains.

Above all, Chion eschews emphatic theoretical gestures. Such gestures inevitably oversimplify what the author would like to maintain as a complex, multifaceted subject. We can see this clearly in his brushing aside of Jacques Attali's *Bruits: Essai sur l'économie politique de la musique* [*Noise: The Political Economy of Music*] (originally published in 1977). Attali himself drew eclectically on Marxism and scientific notions of order and entropy. He liberally invoked René Girard's notions of sacrifice and violence as constitutive of human societies, themselves informed by Freud's *Totem and Taboo* and other texts. His overarching thesis was that "noise" is a form of violence and disorder and that this violence and disorder has a revolutionary potential. From this the author projected a utopian future when we would all become emancipated composers. While Attali's book is not without interest and insights, Chion succinctly remarks its limitations. A slightly expanded account

of these would be the evocative but ultimately unhelpful polyvalence of key terms, "noise" first and foremost; the unjustifiable slippage between extreme loudness, which might be reasonably deemed a form of violence, with other sonic manifestations, including music, all reduced to noise and then treated as revolutionary; and a tendency to vastly overstate historical and psychological effects. Regarding these limitations, I might add that Attali finds himself in good company. The discourse of violence and liberation has Romantic roots and had already reached a heady peak in Nietzsche's *Birth of Tragedy* (1872). In the latter, Nietzsche had contrasted the Dionysian, veil-lifting, corporeal, frenetic impulse in music to Apollonian orderliness, abstraction, and the play of appearances. (At the time, he thought that the two were wed perfectly in Wagner's operas, although later he repudiated both the composer and his own earlier, naive views.) There are traces of this discourse as well in Adorno's notion of dissonance as disruptive. For the critical theorist, jazz momentarily unleashes this power only to bury it all the more deeply in the narcotizing sonic machinery of the culture industry.[27] As for Attali, he continues to attract adherents, especially among enthusiasts of "noise music"—granting that the "music" side of the label is frequently rejected by adherents and detractors alike—who look to the subjectivity-shattering appeal of noise and its supposed, inherently emancipatory force.[28] Meanwhile, Chion has wondered whether it might simply be better to do away with the notion of noise altogether as at best vague and at worst encouraging a sort of sonic snobbery, ethnocentrism, and even racism.[29]

Similarly, while Chion is clearly a thinker about media and the ways in which various *supports* inform sonic experience and sensual experience more generally, he makes no attempt to provide an overarching narrative that would link forms of subjectivity to a dominant medium or media. For Marshall McLuhan, the printing press created a world, or what he in fact called the Gutenberg galaxy. This world began to come apart with the broadcast media of radio and television. Since McLuhan, various other versions of privileging the "mode of information" instead of the Marxian mode of production to provide a coherent, unfolding account of historical and psychic change have been put forward.[30] For Friedrich Kittler, for example, the institutions, pedagogies, and other practices determined by print peaked in the eighteenth and nineteenth centuries. Hermeneutics—interpretation, the quest for meaning mined from texts above all—was print's master science and the molding of minds as fundamentally reading minds a key concern. This unity, along with our subjectivities, was sundered by the arrival of the

holy trinity of early twentieth-century media: gramophone, film, and typewriter. Moreover, Kittler maps these media neatly onto Lacan's distinctions among Real, Imaginary, and Symbolic orders, respectively.[31] Nothing so neat or grandiose will be found in *Sound*, and this without denying the simple fact that media are historical and that changes in media can have profound effects. While some media push out others more or less definitively and permanently—a boom box is as rare as a wax tablet and stylus these days—others evolve, coexist, and mingle. As Schaeffer undertook his experiments, magnetic tape, phonographs, early computing, radio, television, film, and, of course, print too, all shared space. While the shift to digital technologies in recent years is obvious, we still inhabit a variegated and complex media environment, and this is the environment, with an emphasis on sound of course, that Chion invites us to explore with him.

In spite of this commitment to audio media in their diversity—including the manifold manners in which they can be linked to visual media above all—it is true that film is the medium that appears conceptually fundamental for Chion, and precisely because of its "impurity" (which Kittler's mapping seems conveniently to ignore). Radio provided the acousmatic model for Schaeffer; the closed groove of the phonograph that of the sound object. Sound film entails deeply ambiguous relations to both. Film may be acousmatic in a sense. That is, we do not necessarily see the voice on the soundtrack, and this itself can have various effects on the listener, as the *acousmêtre* shows. In the film medium, sight and sound are nonetheless essentially linked, yet they can be decoupled and recoupled in ways that would be unusual and often simply unavailable in everyday conversation and life. For example, when we hear a stick of celery snapped along with the sight of a twisted arm in an action movie, we do not hear the sound's cause as such. Rather, we hear a bone snapping, and this sound reinforces what we think we see, even if there is no underlying "truth" or ground to either. The "sound object" in this case, removed from its source, renders or figures forth *something else*. We hear *as* and not *in itself*. This is what the Foley artist knows, and this is why audio-vision is more than simply simultaneous audition and vision. The term indicates productive conjunctures, the creation of various subjective effects. For these reasons, film is to be celebrated yet approached with curiosity, care, and even suspicion. Constructive and creative, potentially ideological and falsifying, it is medium in which the purity of sonic experience is impossible because of its interplay with the visual. This interplay is one of mutual information and formation, although the visual always seems

to overmaster. For the sound object, film might be called a fallen medium, keeping in mind that things only really get interesting after the fall. Or, to take a related register, in the master-slave dialectic between sight and sound, the former tends to get the acknowledgment; as Hegel has it, however, this is when the latter gets to work.

I have described Schaeffer's philosophical impulses as broadly phenomenological. While these impulses have been transmitted to Chion, the conceptual universe of the latter is ultimately constructivist. This is an unhelpfully large basket, including everything from both structuralist and hermeneutically inclined anthropology to various forms of sociology, linguistics, cognitive neuroscience, and much more.[32] Constructivism might be said, moreover, to stem in large part, like phenomenology itself, from Kant's critical epistemology, insofar as, unable to get to things-in-themselves, we build our worlds through intuitions of time and space, as well as through various categories of knowledge. Speaking generally, constructivism tends not to overcome the divide between objective and subjective but rather to inscribe it as a source of paradox. In spatial terms, an outside is posited as necessary but impossible to grasp in itself. In temporal terms, this paradox shows up in the Heideggerian term, adopted in deconstruction and beyond, of the "always already." For example, we find the "always already" put to use in Lacanian psychoanalysis to describe the structuring effects of language that exist prior to the infant eventually taking up and recognizing his or her place within the Symbolic order. Deconstruction and poststructuralism tended to irritate rather than cure this tendency—repeatedly and ultimately repetitively pointing out the slipperiness of language, the impossibility of presence and unmediated experience, and the problems associated with quests for origins as pure points of departure. In *Sound*, we come across problems of spatial, temporal, and linguistic reflexivity, to be sure, but Chion's constructive and deconstructive tendencies are rich, his paradoxes productive and, finally, mitigated by years of hands-on experience with sound: as a composer of musique concrète, as one who has worked in and not merely on film as an audiovisual medium, as a teacher, and as an observer of the sounds in their multiple, everyday as well as more rarefied, institutional settings. The cryptically idealist bent of much constructivism is tempered by kicking against the rock of practice. Theses are tested in the classroom, where experiments take place and consensuses emerge, as well as through the feedback loop of reception. In film in particular, where sounds are shaped with an ear to nar-

rative, emotive, and other "effects," it becomes possible to measure success and failure, however tentatively. The question of what works sonically becomes inseparable from considerations of why. Calling up an American school or perhaps antischool of philosophy, there is something deeply pragmatic about Chion's approach.

While the title of Chion's book proclaims a simple word that hides complexity, its subtitle confronts us with a neologism and seeming technicality: a "an acoulogical treatise." At the outset of his research program, Schaeffer had suggested a discipline of "acousmatics" that would focus on the experience of sound as opposed to acoustics, for which a science of waves and vibrations already existed. He would later somewhat offhandedly suggest along the same lines "acoulogy," the term that Chion has embraced and that specifies his domain as the multifarious one of listening and listeners. As for the other part of the subtitle, Chion's "treatise" is neither the diary-like, tentative inauguration of a program that we find in Schaeffer's *In Search of a Concrete Music* nor, in spite of the shared generic marker, the latter's seemingly definitive statement of his findings: the *Traité des objets musicaux*. Rather, the work translated here retains the probing, tentative quality of the former with knowledge gained over a career in sound. First published in 1998 and substantially revised for the 2010 edition, *Sound* is in many respects—and the author refers to it as such in his preface to the later editions—an *essay*, which in French retains the sense of an effort or attempt. Fittingly, it ends with a lengthy citation of a loose page of observations that the author wrote in 1971, early on in that career, and that he subsequently rediscovered. A youthful, exuberant expression, post-'68, of the politics of sound, this page sketches a project, more or less, to transfer the Situationist critique of the society of the spectacle to the sonic domain. Many of the concerns that we find some forty years on are still intact, but the combination of revolutionary optimism and pessimism about the system is gone. Or, rather, these attitudes are toned down, fused and metamorphosed into thoughtful enthusiasm. There is a sense that any approach to a politics of sound must first pass through a hard-earned and never quite achieved ethics of listening. Returning to Hacking's gradations of constructivist commitment, we might say that the revolutionary degree is now absent, but that all the others remain: historicist, at times ironic, unmasking—or whatever the sonic equivalent might be—and circumspectly reformist. If "reduced listening" sometimes appears a quixotic quest for a sonic purity that cannot

succeed, the overwhelming sense of *Sound* is that this mode of approaching the sound world—frayed borders and all—is both curious and interested. In *Sound*, the acousmatic has been returned to pedagogy: the work not only of a teacher committed to demystifying and unsettling reified "sound objects" but of a dedicated pupil of auditory experience. No shouting. All ears.

Preface to the French Edition of 2010

Initially published in 1998, my essay *Le Son* [*Sound*], greatly restructured and lightened for clarity and readability, has become a volume with a less modest title but one that openly asserts the idea of a novel discipline: acoulogy. This work, intended for those interested in the topic from whatever discipline, for the most part gathers together my research, observations, and acoulogical experiments undertaken over the past thirty-five years and more.

Thanks to the multiple ambiguities that the vague meaning of the word "sound" sustains, there can be no agreed-upon overview of all that has been written on the topic. This is inevitably an engaged book and one that makes arguments, but it also proposes an entire series of overtures, proposals, reflections, and original concepts. To do so, it goes back to language, and this is why the word "acoulogy," which Pierre Schaeffer coined and which I have taken up again in order to redefine it, seems to me the most appropriate to denote the discipline put forward here. My experience as a composer, interpreter, producer, and, in general, a sound maker of musique concrète and for radio, television, video, and film, as well as my experience in training and teaching (notably at the École supérieure d'études cinématographiques and at the University of Paris III), has also been very helpful. Which is to say that when it comes to this subject, the demarcation that some would presumptively draw between a theoretical approach and a practical one seems to me artificial.

My warmest thanks go once again to Michel Marie, who has both followed and encouraged the realization of this work, and who enabled its publication in the series that he created.

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PART I • hearing

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1))) Listening Awakes

Yes, it is Agamemnon, your king, who wakes you;
Come, acknowledge the voice that strikes your ear.
[Oui, c'est Agamemnon, c'est ton roi qui t'éveille.
Viens, reconnais la voix qui frappe ton oreille.]
—Jean Racine, *Œuvres complètes*, vol. 1, 1950

With these two lines of verse, Racine's tragedy *Iphigénie* begins. They constitute a familiar introductory tactic for the author, which consists in raising the curtain on a conversation already under way. In this case, the lines make the voice of Agamemnon resonate as he addresses his servant Arcas, at the threshold of dawn, as if first heard while half asleep. The voice seems to come from Arcas's dream, while simultaneously wrenching him from that dream, and the words wreck themselves at the end of the night, at the edge of the unconscious, and are tossed onto the shore—the same shore where the encamped Greek army waits for the gods to raise the wind. But these two lines also presuppose words spoken previously by Agamemnon that have not been clearly heard, that have been recorded somewhere, all the while becoming lost, as much for the servant as for the spectator. It is thus in the nature of sound to be often associated with something lost—with something that fails at the same time that it is captured, and yet is always there. In this opening inspired by Euripides, Agamemnon, let us note, speaks of himself in the third person, as adults often do with infants ("Don't worry, mommy is here"). There is here an interesting reminiscence: in the second book of the *Iliad*, a work with which Racine was quite familiar, the same King Agamemnon finds Zeus sending him in his sleep a talking—and deceptive—dream. This

dream, which takes on the appearance of the wise Nestor, begins with an admonishment ("Still asleep, Agamemnon?") and, at the end of its message, adds an order: "But keep this message firmly in your mind. Remember—let no loss of memory overcome you when the sweet grip of slumber sets you free."[1]

Waking Impressions (On a Poem by Victor Hugo)

Iphigénie is set on the shore in Aulis, but it is at the edge of another sea—in Guernsey, the Anglo-Norman island—that Victor Hugo wrote the following, little-known poem, included in his collection *L'art d'être grand-père* [The art of being a grandfather]. Since it will serve as our point of departure for reflection on what an "acoustic tableau" might be, I will give it in its entirety:

I hear some voices. Glimmers through my eyelid.
A bell is swinging in the Church of Saint Peter.
Shouts of swimmers. Closer! Farther! No, over here!
No, over there! The birds babble. Jeanne too.
Georges calls to her. Cockcrows. A trowel
Scrapes a roof. Some horses pass in the alley.
Creaking of a scythe that cuts the lawn.
Impacts. Murmurs. The roofers walk on the house.
Sounds of the port. Whistling of stoked machines.
Military music that comes in gusts.
Hubbub on the quay. French voices. *Merci*.
Bonjour. *Adieu*. Doubtless it is late, because here is
My robin redbreast, come to sing right next to me.
Din of distant hammers in a forge.
The water laps. A steamer is heard panting.
A fly enters. Immense breath of the sea.

[J'entends des voix. Lueurs à travers ma paupière.
Une cloche est en branle à l'église Saint-Pierre.
Cris des baigneurs. Plus près! plus loin! non, par ici!
Non, par là! Les oiseaux gazouillent, Jeanne aussi.
Georges l'appelle. Chant des coqs. Une truelle
Racle un toit. Des chevaux passent dans la ruelle.
Grincement d'une faux qui coupe le gazon.
Chocs. Rumeurs. Des couvreurs marchent sur la maison.

Bruits du port. Sifflement des machines chauffées.
Musique militaire arrivant par bouffées.
Brouhaha sur le quai. Voix françaises. Merci.
Bonjour. Adieu. Sans doute il est tard, car voici
Que vient tout près de moi chanter mon rouge-gorge.
Vacarme de marteaux lointains dans une forge.
L'eau clapote. On entend haleter un steamer.
Une mouche entre. Souffle immense de la mer.][2]

Often in a Japanese haiku an auditory scene will be set forth in its seventeen syllables. But a poem of this length dedicated solely to sonic notations is a real rarity. Of course, they are not entirely sonic, since the first line lays down a visual impression: "Glimmers through my eyelid." This is a line, moreover, that puts in place a subject who is certainly conscious, even if only halfway: "I hear some voices." Consider as well the frequency of indefinite articles ("some voices," "a bell," "a trowel," "a scythe," "some horses," "a forge"), along with nouns lacking an article ("French voices," "shouts," "creaking"), as if a sound should acquire through *acousmatic* invisibility—and it is specified that the poet has his eyes closed—a certain generality and abstractness. Yet the last line juxtaposes an indefinite article to a definite one: "A fly" and "the sea."

The sensations in the first line are the most general and the most anonymous: "voices" and "glimmers." But the second and third lines introduce a familiar frame, human and inhabited: "the Church of Saint Peter" and a seashore. There are snatches of speech: "Closer!" "Farther!" and ". . . over here!" These words remind us that sound can go astray as far as direction is concerned. At the same time, however, they produce a sense of perspective. As if blind, the bathers guide one another. The cries of "Closer!" and "Farther!" also evoke the distance of the sound itself. It is a fragile tableau, and one that is simultaneously made and unmade, with planes both close by and far off. After space comes time. The "cockcrows" appear as the approximate concretization of a query about the time of day. They were an important point of reference in an era when street criers and church clocks took care of the function that alarm clocks have today. Other indications have already revealed that the bathers are awake, that the children are outside—in short, that the household is up and about. The swinging bell in the Church of Saint Peter doesn't mark the hour, but it does suggest the beginning—or rather the end—of a service.

Note that the phrase "Some horses pass in the alley" is not inherently sonic. Only because of the context does it become acoustic. A detail, however, might lead the reader to guess as much: the fact that only horses are mentioned. These horses are doubtless being driven by someone and are pulling something. If what was being put into relief were visual, perhaps the poet would have spoken of a specific cart or a specific coachman. Here, he reduces the scene to that which the sound recounts—to that which personalizes and animalizes the *direct cause* of the sound. As in animations, a trowel scrapes all alone on a roof, horses without a driver pass by without pulling anything, a scythe cuts the lawn by itself, and masterless hammers kick up a din.[3] Turning to "impacts" and "murmurs," we are faced with words that are vague, and yet not so vague as all that: the former designates sounds that are punctual and successive, the latter a sound that is lasting and muddled. Next, there is a sound that comes *from above*, a sound of footsteps, of men: "The roofers walk on the house." These sounds are identified and localized. The space is woven with reassuring sounds. Moreover, the definite article returns: "Sounds of the port." At this point, the theme of breath, with which the poem culminates, makes an appearance: "whistling" and later "gusts." As for "French voices," we recall that the poet is in exile on an essentially Anglophone island. These are isolated words that break loose from the collective hubbub. Then comes spatial seesawing: a robin that is "right next to me" and "distant" hammers. The sea asserts itself with the word "water." Then once again the theme of breath with the word "panting," endowing a steamer with lungs. Slowly, the vocal, respiratory character of sound gains ground. And finally, we get to the last line, with its punch-line effect that compares an insect to the ocean, an antithesis typical of the poet and one that provides maximal contrast in terms of scale: "A fly enters. Immense breath of the sea." The sound of the sea is the one that ceases neither day nor night, whereas the rest are either sounds specific to the morning (church bells, cockcrows, the robin) or otherwise daytime sounds.

Let's consider more closely the phrase "A fly enters." The fly, as we have seen and will see again, represents the undesirable companion. Its sonic presence is heard like empty chatter, but it also incarnates in this case sound that cannot be captured—sound that is interrupted and restarts according to its own law. As the final line sums up, the poet has been ceaselessly channel-hopping from words captured in passing ("*Merci*") to sounds that endure ("a forge"), sonic events ("A fly enters"), and soundscapes that are either constant or eternal ("the sea"). When one focuses on one of these,

is the other still there? This is what sound is: this coming and going where something has moved in the meantime, between the coming and the going. For the French speaker, it is hard not to hear *de la mère* (of the mother) in the phrase "Immense breath of the sea" ("Souffle immense *de la mer*" in the original). One imagines a proximate and gigantic respiration. But isn't this immense breath also the image of his own, so proximate respiration that the sleeper scotomizes? And so Hugo concludes his poem with a mirroring confrontation of the poet and the cosmos: sound, when I make no effort to reproject it outside, is it in me? All of this—these sounds of voices, of tools, of horses, of bell towers—wouldn't this be fomented within me, contained in my internal respiration like the marine breath—the inverse image of my own breath—foments, encompasses, absorbs, in Hugo's punch-line ending, all the other sounds?

Further, with Hugo it seems that the exterior sound of the sea neutralizes the interior sounds of the house and attracts them to itself. Thus freed, the poet no longer hears the "organic creaking of the woodwork" (to borrow a phrase from Proust), and everything he perceives belongs to the outside. And this is doubtless so that the fly in the end can make his entrance. So it is that an entire exterior and protective space, made up of familiar noises, has been built up by sound, and yet all that has to happen is for a fly to enter. That little fly makes space swivel because it crosses a double boundary: that between the world outside and the room, and that between the exterior of the body and its interior. And why not, since a fly just might crawl into one's ear!

In his famous mirror script, Leonardo da Vinci wrote in his notebooks: "I ask whether a slight sound close at hand can sound as loud as a big sound afar off?"[4] While the question went unanswered, Hugo, by comparing sounds of such different scale, echoed it. Eisenstein evoked the example of the cockroach about which we say that it is shot "in close-up" if it takes up a large part of the image, whereas the same will not be said of an elephant that takes up the same amount of space or even fills the entire screen. This is because, relative to our own scale, these two creatures are different sizes. The same goes for sounds: certain sounds, even when they are loud or heard from close by, conjure small sources. It is not necessary to be able to attach a precise name to the cause in order to make an evaluation of scale. In other words, for certain sounds we can produce a representation of the strength of the cause in relation to us without needing to identify the cause, independently of the intensity with which the sound reaches us. We call this the "weight-image" of the sound, or, to put it another way, the representation (stable, independent

of the intensity of the diffused sound and of distance in relation to the source) of the strength of the cause in relation to our own scale.

This concept provides a real response to Leonardo's question. For example, the close-by buzzing of a fly—a creature that interested da Vinci quite a bit—is not as loud as the big yet distant noise of cannon fire—another sound that the *maestro*, great inventor of weapons, found compelling. If you hear a truck or rumbling of thunder in the distance, they remain "big sounds," tied as they are to the experience of such sounds relative to our scale. When someone is made to listen to sounds via a loudspeaker without being told about their provenance, the auditor scans, whether consciously or not, apart from the cause of the sound, for the order of magnitude of the phenomenon—whether it belongs to something big or small relative to him or her. Little details of pitch, articulation, and attack, which indicate proximity, might lead one to infer a slight weight-image. And sounds heard as having great power are those that don't have indices of proximity, those with a slow and heavy flow. Another thing that gives us a sense of scale is the volubility or lack thereof of a phenomenon. A sound's agility or ability to shift rapidly in its details contributes to the construction of its weight-image. But there are sounds, like that of the wind, that don't necessarily consist in indices of proximity or of characteristics that would allow us to decide whether they are powerful and heard from afar, or slight and heard from close by. At other times, the presence of strong reverberation all around a sound attests to a phenomenon powerful enough to awaken the space and thus produces a voluminous weight-image.

Can We Speak of Soundscapes?

Concerning Hugo's poem, can we speak of a so-called sonic landscape, that is, of a totality organized in space with both foregrounds and backgrounds, with both details and ensembles, that hold together? Here we face head-on the problem of knowing whether we can totalize what we hear. In the 1960s, R. Murray Schafer, starting with this hypothesis, created the notion of "soundscape." For these, he lays out various descriptive criteria. First, there is matter of "keynote":

> In music, keynote identifies the key or tonality of a particular composition. It provides the fundamental tone around which the composition may modulate but from which other sounds take on a special relation-

> ship. In soundscape studies, keynote sounds are those which are heard by a particular society continuously or frequently enough to form a background against which other sounds are perceived. Examples might be the sound of the sea for a maritime community or the sound of the internal combustion engine in the modern city. Often keynote sounds are not consciously perceived, but they act as conditioning agents in the perception of other sound signals.[5]

Proceeding logically, Schafer next defines that which against such a "background sound" constitutes a "foreground sound," and he labels the latter "signal": "Signals are foreground sounds, and they are listened to consciously." As examples, he mentions police sirens, train whistles, and, yet again, bells. The psychological definition of "foreground" here must be approached with caution. In many instances, we no longer pay conscious attention to police sirens, but they remain no less distinct sonic elements because they are shaped.[6] Finally, the composer and theorist differentiates "soundmarks." A "soundmark" is sort of a community's sonic jingle. Or it can be a sound characteristic of a trade or a familiar sound for which an attachment is felt and to which is given a symbolic and affective value (the rusty hinge of an old door, an old sewing machine, etc.). The "soundmark" close to Schafer's heart is the foghorn of the Port of Saint John, in his native Canada. The idea of "soundmarks" is very interesting, but in many instances it is not relevant and has only a picturesque value. In fact, in a film, "soundmarks" are not predetermined but rather completely fabricated by taking up a given sound over and over again in the course of editing, associating it with a place or with a situation, such that the symbolic role of incarnating and encapsulating the latter is conferred on it.

As you can see, this descriptive schema is rudimentary, but it clearly underlines a fundamental distinction: that between figure and ground. With this, we have only to remark that the sound of the sea is the ground and that the various other sounds that Hugo describes are sometimes "signals" (the church bell) and sometimes "soundmarks" (for the poet, *his* robin redbreast). And yet, at the same time, this tableau is situated at a precise moment in the day and anchored in the fleeting instant. What is particular to Hugo's poem is that everything is uncovered *successively*, and the juxtapositions, since these there must be, are implied. And this is so even if the visual aspect of the poem—the fact that it fits on a page and lends itself to a synoptic glance—evokes for us something global and polyphonic. Actually,

we don't imagine that the forge becomes silent when the fly enters or that the blasts of military music don't at some point cross the path of the roofers. One of the properties of sound is mixture. "Booz endormi [Boaz slumbering]," another poem by Hugo about sleep—and a much more famous one—contains the following description: "The respiration of Boaz who was sleeping / Mingled with the muffled noise of the stream on the moss [La respiration de Booz qui dormait, / Se mêlait au bruit sourd des ruisseaux sur la mousse]."[7] This description, which takes off from sounds with a weak weight-image, implies—since, after all, you can hear them—the surrounding silence. It also links, in the same way the scene links Ruth to Boaz, water to breath. In book 1, line 87, of *The Aeneid*, Virgil puts before us the scene of a storm: "Insequitur clamorque virum stridorque rudentum."[8] Translated literally this means: "The clamor of men comes after the strident cry of the rigging." We find ourselves at the heart of the problem: the simultaneity of a "sonic tableau," in those instances where the expression can be legitimately applied, is perceived in terms of a succession.

Ending with the ocean very nicely suggests the tendency of sounds to absorb themselves into one another. A sound can always be drowned out by another, just as the "immense breath of the sea" links and potentially submerges (at least in memory) these disparate noises, while at the same time unifying them. When Proust, who listened attentively to nocturnal sounds, describes in *Swann's Way* the foliage of a chestnut tree as "circumscribed," we understand that he is far from the sea: "What had to move—a leaf of the chestnut tree, for instance—moved. But its minute quivering, total, self-contained, finished down to its minutest gradation and its last delicate tremor, did not impinge upon the rest of the scene, did not merge with it, remained circumscribed."[9] And we feel in this instance that with Proust the finely incised sound of the chestnut tree draws in intaglio the silence that enables it to be perceived. In this way certain sounds create around themselves, by the fact of being audible, the context as a whole. All the same, they do so on the condition that another sound does not intervene and drown everything out. Even if it was implicit in the bathers, the port, and the steamer, the "immense breath of the sea" is, in Hugo's poem, a dramatic turn of events.

I have said that this poem is exceptional insofar as it is, other than the first line, practically just an enumeration of sonic impressions, but it does belong to a poetics of distant sound. The sounds named in Romantic prose and poetry are often those that resound from afar, those with a cause that is

remote or invisible. Such sounds are as if *drawn aside* from vision or from the presence of their cause. With Lamartine, it is life that is heard from afar: "the stifled clamor of the waves on the rocks [Des flots sur les rochers les clameurs étouffées]."[10] With Stendahl, there are impressions of distant festivals or cannonades in *The Life of Henry Brulard* and *The Charterhouse of Parma*. In the latter we read: "Nothing could be merrier than the sound of the *mortaretti* heard in the distance on the lake, muffled by the plash of the water."[11] Or that when Fabrizio is at the Battle of Waterloo: "he could see the white smoke of the battery a long way off but, in the midst of the regular, continuous rumble of the cannon, he seemed to be able to hear shooting from much closer by. He could not understand it at all."[12] These sounds emphasize by a sort of mirroring effect, as it were, the individuality of the one listening to them. They designate a solitary and contemplative listener. During the Romantic period, however, no one spoke of a "sonic environment"—nor of "environment" in general—as we do today (except perhaps in German, where the term *Umwelt*, literally the "world around," has long been in use). There was a sound and a person.

At times, in such a listening position, the feeling of being at the center of sound appears as a revelatory fantasy—for the center of sound is no more here than there—that marks the often egocentric and centripetal nature of audition. This fantasy is in some cases associated with a sense of persecution and at others with plenitude or peacefulness, with a melting into the universal, as when Paul Valéry writes in his *Ego Scriptor*: "Asleep, insensible, in the sun, at the heart of all the sounds and flowers."[13] On the contrary, in several of Kafka's writings, such as the prose piece "Grosser Lärm," or "Great Noise," the author sees himself as the target—as both the receiver and the orchestrator of the sounds that persecute him—he who deems himself at the helm of the "headquarters of all noises."[14] He is both victim and organizer. The seated subject listens within himself to the sounds that stream all around—all that he hears from his room in his parents' apartment: the babbling of his sisters, the door slammed by his father, a canary in a cage. We have here the inverse of Hugo: with Kafka, every sound is referred to the interior of the human dwelling; not one opens out onto the sea, onto nature, or onto humans beyond those of the immediate family. From Kafka's pen, the poet's minutely described tableau of Guernsey—which I have suggested we should think of as a sort of anti-tableau that undoes itself in the process of description—would become a persecutory nightmare in which the writer would feel himself as if perforated and disturbed by all the sounds.

What's more, when a couple having a conversation—let's say a man and a woman—imposes itself on us, we cannot help but feel that it concerns us. Why is this so? The reason is that in our archaic experience we found ourselves while present spoken about in the third person. Mothers will say, "He ate his little jar of baby food" or "She nearly gave me a heart attack," in such a way that any "he" or "she" who wasn't us could just as well be. This is what Francis Ford Coppola's film *The Conversation*, coedited by Walter Murch, deals with. The surveillance expert played by Gene Hackman has recorded on behalf of a wealthy client the conversation of an adulterous couple in a park—a conversation in which the couple exchanges banalities about a bum asleep on a bench. He listens over and over to their words, and little by little gets stuck—and we along with him—on the refrain of "he" in the exchange between the man and woman: look at him, this bum, "he" was once a little boy; "he" is cold; "he" is alone. And as we watch the Hackman character let the recording run, and as he allows the phrases to fill the space in his loft—whether he is at work or reclining as a woman makes love to him—it is about him and about ourselves that we think. That is, until, in a final twist that indicates the ambiguity of audition, the listening subject perceives that he has been tricked by this identification and that a simple change in stress in a phrase radically inverts the meaning of what he was attending to.[15]

The Ontogeny of Audition

It would appear that the ear awakes starting at four months into fetal life. Based on several observations, the embryo, at the stage of development at which the ear has begun to function, "hears" the sounds that accompany variations in pressure on the bodily walls, as well as two cycles of heartbeats, that of the mother and its own. These oscillating cycles of different speeds drift apart from one another and then rejoin, match phases and then fall out of phase, as in the repetitive compositions of minimalist music, which for this reason can have a de-realizing effect—at the level of time—since they evoke in us an archaic temporality. This is what the psychoanalyst Françoise Dolto calls "the coarctational rhythm of the two hearts of uterine life," and that she puts forward as already linguistic. According to Dolto, the newborn must mourn his or her own heartbeat, which after birth ceases to be heard. But what do we mean when we say that a fetus "hears"? Certainly it is not the same for an adult and for a fetus that is plunged in a

liquid environment and does not experience or discriminate sensations in the same way as an adult, if only because lacking both familiarity and the words to do so.

In fact, I am convinced that when things are said, their manner of being changes. Sensations that pass via the stage of being named—and when this naming is not distracted or negligent but rather corresponds to a true restructuration—become something other. Moreover, and independently of the acoustic nature even of bodily and external "sounds" perceived in utero—filtered and constrained—an entire series of sensory and motor experiences that will give sound a different meaning is yet to come.

In any case, the most archaic stage of what we could call sonic sensation for the little human is a rhythmic pressure. These rhythmic foundations, which are felt very early on, might be taken as the *transsensorial* bass on which will be built all the music of postnatal perception, regardless of whether subsequent rhythm comes via the eyes, the ears, or touch. At the prenatal stage, it is still a matter of what I will later describe in terms of *covibration*, although maybe not yet of something passing via the auditory window. The fetal ear bathes in amniotic fluid. This is why subaquatic audition, which is monophonic and largely transmitted by bone conduction, has been, in certain therapeutic and musical projects, presented as a happy return to the origins of primal listening. This so-called return needs to be put into perspective, however, since it does not suffice to dive into water to become the baby that one no longer is. At birth, the ear emptied of amniotic fluid, we must adapt to the aerial environment.

Surrounding the infant, prior to birth even, there is language. Or, in certain instances, rare but decisive for the life of such children, no speech at all. An infant, left to himself, deprived of linguistic contact, as happens with certain future autistics, grants linguistic value to the encounter of sounds and his sensations. As Dolto puts it: "The entire world of things is in conversation with him, but not the world of humans."[16] The films of Tarkovsky—most notably his final film, *Sacrifice* (1986)—give admirable expression to this network of crisscrossing sensations: the coincidence of sounds and lights such as the flight of birds, the creaking of a closet door, a ray of sunlight suddenly piercing a room, rustling leaves, all of which give the impression of a secret language.

In a sense, an infant hears more objectively than we do insofar as he or she does not yet filter the sonic whole in order to extract the useful signal. The voice, when heard by an infant, appears completely wrapped up in and

extended by the reflections that it releases into space. Later and little by little, the variable reverberation that accompanies any vocal, sonic emission in a resonant space will be repressed, scotomized, mentally minimized by the adult, in order that the perception of the direct sound—that is, the sound that arrives at our ears via a straight line—not be blurred by the reflected sound—which arrives with a lag. And this is done so as to better isolate the verbal message. This would explain why, when we hear a reverberant voice in a church, a cave, a piece of musique concrète, or in a movie scene, we have a feeling of the archaic—of a return to the origin. This is because the baby that we once were did not yet distinguish between direct sound and reflected sound, and heard sound in a sort of vast echo chamber.

An infant keeps in its memory everything that was said to her. The remembrance, sometimes hidden in the unconscious, of phrases pronounced very early in infancy is attested in numerous cases. She also hears what is said about her, and, what's more perhaps, as in *The Conversation*, might think that everything that is said concerns her. She also emits sounds and does so more or less unconsciously at first. Yet in so doing, when it is a matter of calling or naming, there is a necessary diminution of the reliance on smell (as Dolto has noted).[17] This is an important observation: vocal emission would be linked therefore to a privation, and thus, perhaps, might be considered in terms of an interval or pulsation. To be quiet and therefore to listen is the chance to breathe and to retrieve what has been lost. In the jargon of psychology, *lallation* is the name given to the sound games of infants, their babblings, which are both an incorporation of the sounds that they hear and an imitation of voices and of phonemes. A wee man or woman unconsciously emits sounds in imitation of those received. Later, above all with boys, children will become Foley artists to their games, and will make the sounds of cars, motors, journeys, and so forth, in imitation of what has been heard on television. Finally, while talking about the phenomenon of imitation, we must not forget a major given of the human experience: transposition to higher octaves. In *L'empreinte des sens* [The imprint of the senses], Jacques Ninio notes that the principle of transposition goes back to the first months of life, when, at a certain moment, a baby begins to vocalize like those around him or her: "A French baby will say 'blib, ta babelib.' A baby in an Anglophone context will favor diphthongs: 'bee-ow, ya-wou, boo-ow-ow.' A baby of the same age in an Arabic-speaking context will try out other vocalic attacks: "aw, da'a.' And a Chinese baby babbles musically on ascending and descending pitches."[18]

The imitation of external noises—not only voices—and the constant incorporation of sounds could be one of the bases of audition. We can relate it to the observation made most notably by Alfred Tomatis—from which the latter drew out the most radical consequences—that one can only emit vocally what one hears. This is known as the *audio-phonatory loop*. In other words, someone who can no longer hear certain frequency zones can no longer attain them with his or her voice. And it was when he had actors or singers who consulted him listen to those frequencies now missing from their vocal registers that Tomatis could make them once more attain them. Hearing oneself speak [*s'entendre parler*] is at first unconscious, but we can put forward the hypothesis that this hearing oneself speak, which links a sound (in the middle ear) to a vibration (in the larynx, cranium, or sternum), could contaminate the entire experience of listening in general. Ultimately we incorporate, even as adults, every sound we hear as a sort of internal vocalization.

The crucial and oddly little-studied period of the voice changing, in particular with boys, is another poorly understood aspect of vocal development and of hearing oneself speak.[19] Whereas with girls the voice only drops by two or three tones, the drop with boys can be as much as an octave. The scotomization of the voice breaking as a determinant episode, which transforms how the subject hears himself—and not only when he is in a children's choir and the breaking of his voice deprives him of both instrument and identity, as happened to the young Franz Schubert—is a culturally intriguing phenomenon.

Last but not least, there is the matter of language learning, which perhaps comes to organize and structure all sonic perception in general and not simply that related to spoken discourse. According to Roman Jakobson, the carving up of audition and of the perceptual flux into phonemes begins with consonants: "In the acquisition of language the first vocalic opposition appears later than the first consonantal oppositions: hence there is a stage of development in which consonants already fulfill a distinctive function, while the lone vowel functions only as a support for the consonants and as a means of providing expressive variations. Thus we see that consonants assume phonemic value before vowels."[20] Vowels, carriers of pitch and capable of prolongation, will henceforth modulate the mythical primal language, of which music would be the sublimation. From that moment forward, sound is placed under the sign of a fall: it is language's remainder—a remainder shared by music and that so-called shapeless zone that we call noise. Is this why our culture refuses to define it?

2))) The Ear

Sound as the Object of Acoustics

How many times have I heard, when I have mentioned that I am writing a book on "sound": "What's it about?" Each day and at every moment, in fact, we talk about sound in every conceivable context, but the second it becomes a topic in itself, suddenly we no longer know what it is. Let me begin, then, with a summary account of sound considered from the most certain and objective angle: starting from acoustics as a shared and accepted body of knowledge. On the level of physics, what we call sound is a vibration, which I suggest we call—reviving an old word—a "verberation." This is a wave that, following the shaking movement of one or more sources that are sometimes called "sounding bodies," propagates in accordance with very particular laws and, en route, touches that which we call the ear, where it gives rise to auditory sensations, and not without also touching—we shall see later on how this "also" is a source of confusion—other parts of the body, where it sets off shocks, covibrations, and so forth, more diffuse and not able to be reified. This wave presupposes a medium of propagation, without which there is truly no sound to speak of at all. Physically speaking, sound "is" this shaking movement of the medium in question: "Sound propagates via waves in concentric circles. Not without reason do these recall the circular ripples seen by someone who throws a rock into calm water. Moreover, this comparison must include the complexities introduced by the reflection of the waves on the shores as well as by various sorts of damping effects that interact with the initial disturbance."[1]

In the air, the sound wave—the verberation, or what might also be called the phonogenetic wave—propagates at a speed of approximately 340 meters per second. As you can see, this is almost a million times slower than the speed of light, and this accounts for the well-known lag that has the flash of lightning arriving before the rumble of thunder. It was only at the beginning of the nineteenth century that this average speed of sound, which varies slightly relative to pressure and temperature, was able to be calculated. In water, the wave propagates considerably faster (about 1,500 meters per second), but, by contrast, such sound is monophonic and heard primarily via bone conduction. As we know, certain hard or taut materials will transmit sound (as in the childhood experiment of attaching two paper cups with a string). In this case, we can speak of solid sound transmission. This is the reason it is so difficult to soundproof apartments that are located one on top of the other.

Putting the matter of duration aside, sound, in the physical sense, has only two characteristics of its own: *frequency*, or the number of oscillations per second (usually expressed in hertz [Hz]), and *pressure amplitude* (often simply called "amplitude," it correlates with pressure and thus to the magnitude of the oscillation). Having said that, we should be aware that a sonic phenomenon usually consists of several superimposed frequencies, which can be periodic or not, along with different amplitudes, with the ensemble subject to variability from one instant to the next. The frequency or frequencies are perceived as pitch or, more generally, as mass. Amplitude is perceived as sonic intensity (on which more below). All of the other perceived characteristics of sound are produced by variations of frequency and amplitude over time. Contrary to what some—applying a veneer of a quantitative and physical logic over a qualitative and perceptual logic—have thought, however, we cannot treat these other characteristics as sonic qualities that would be "derivative" of mass and intensity. Notably, the characteristic attacks of certain plucked or hammered string instruments (e.g., guitar and piano) impart sensations that, even if they are the result of combined and rapid variations of intensity (in the form of a descending gradient) and of harmonic spectra (the gradual disappearance of a sound's harmonics), are totalized as specific perceptions of attack.

It is not my concern to deal in detail with the science of acoustics qua the study of the propagation, reflection, refraction, and diffraction of sound (in the sense of verberation) in relation to various media. There are numerous

available technical writings on the subject, published in encyclopedias and in the specialized literature. A few points of reference will suffice. Sound propagates from its source in a circular or spherical manner, like a wave on the surface of a body of water into which a pebble is dropped. This propagation thus takes place in every direction (with successive phases of compression and expansion), and it weakens in proportion to the square of the distance traveled. There is *reflection* when the verberation encounters a surface that does not absorb it completely and returns a portion, like a bouncing ball. When we hear simultaneously—and this is often the case—a sound via direct propagation from the source and a reflected sound (bouncing off the walls), the lag between the direct sound and the reflected sound, which is explained by the slowness of sound and by the variable magnitude of these reflections depending on the makeup of the particular space or environment, combines to produce *reverberations*. The latter either prolong and carry the sound or, if they are of a greater magnitude, hinder its perception (this is especially true of speech). Reverberations either weakly or strongly blur a sound's contours.

When a sound wave encounters an obstacle, a portion will bypass it, and we then speak of diffraction. It is this that makes acoustic isolation all the more difficult to achieve. Generally speaking, high frequencies are more directional than low frequencies. This entails various consequences, both with regard to the conformation of the pinna of a variety of species and in relation to what we call the "stereophonic" effect. In particular, this explains why someone can suggest setting up a so-called high-fidelity system in which the high and middle frequencies are spread over two loudspeakers but the bass portions of the signal are emitted by just a single "subwoofer."

The Ear and Its Labyrinth

Something specific to the human ear is that it is an organ at once external and internal, whence perhaps the particular symbolism associated with sound, and that makes it a link between different worlds (real and imaginary) and different registers (physical and mental). The "ear" as organ is usually divided up into outer, middle, and inner. The outer ear, which in humans consists of the pinna or auricle and the auditory canal, is considered an apparatus both of *protection* (against bodies that might enter but also against the wind and other phenomena that might interfere with audition) and of *resonance*. The pinna directs waves toward the tympanic membrane, and its

form favors the selection of certain frequencies, namely, those that we use in verbal communication. Yet the ability to move the ears in order to localize and isolate certain sounds is a privilege reserved for species other than our own. For cats and rodents, the localization of phenomena that would be for us very high-pitched—and thus very directional—is vital for the detection of danger or of prey. The ear canal of the human adult is on average 7 to 8 millimeters in diameter and 2.5 to 3 centimeters deep. Its structure also allows the privileging of frequencies within the range of human speech, while it tends to eliminate or attenuate sounds that are apt to impede verbal comprehension, namely, bass frequencies.

The middle ear is the internal apparatus made up primarily of the tympanic membrane and the series of ossicles that traditionally go by the names "hammer," "anvil," and "stirrup" and that function to transform airborne pressure vibrations into mechanical vibrations, which are passed along to the entrance of the cochlea, which is known as the oval window. The tympanic membrane, approximately one centimeter in diameter, is an elastic membrane that contacts the first of these ossicles: the hammer. This series of little bones transmits vibrations from the tympanic membrane to the inner ear, and it amplifies frequencies between 1,000 and 4,000 Hz. Once more, certain frequencies receive preferential treatment. It is at the level of the middle ear that are located apparatuses that protect against sounds that are too loud. Two muscles play an important role in this regard: the tensor tympani (eardrum tensor) disengages the hammer or malleus from the tympanic membrane, while the stapedius (stirrup tensor) "pulls the stirrup perpendicularly in relation to the direction of vibration, which attenuates transmission."[2] The contraction of these muscles thus "simultaneously contributes to the compression of powerful signals" and "to adjustment of listening under noisy circumstances."[3] These muscles not only protect the inner ear against noises that are too loud (provided at least that there is time to react), but also, every time one speaks, are activated as part of those numerous feedback mechanisms that constitute the audio-phonatory loop: "The contraction of the stapedius is provoked as well by vocalization, with the muscular response preceding vocal emission. It would appear that this is a mechanism to ensure the reduction of the effect on the ear of emitted sounds of the person emitting them."[4] These mechanisms explain how one can adapt to loud yet constant noises but also how, in situations where one is subjected to violent contrasts in intensity in relation to the surrounding environment, the ear—for lack of preparation—can suffer traumatic damage.

Lastly, there is the inner ear, which consists of organs that contribute to balance (utricle, saccule, and semicircular canals) as well as to audition. The organ of the latter is the cochlea, which takes its name from the Greek for "snail" on account of its coiled shape. Here, the vibrations of the oval window in turn put into motion a liquid, as well as the organs inside of the cochlea, including the hair cells, which are distributed along the length of the so-called basilar membrane. These hair cells number around 3,500 and are connected to some 30,000 neurons. The basilar membrane, situated within the coil, is often compared to a five-millimeter keyboard where various pitches are distributed. It is here that spectral analysis takes place—or not, depending on the theory. Each cochlear nerve fiber is activated preferentially by a given frequency, and these fibers are distributed in a typical fashion (according to the theory of "tonotopy," or place theory).

For a long time the question of whether harmonic analysis takes place at the level of the cochlea or at more central level, in the brain, was an open one. Three theories were forwarded one after another. First, in the theory of resonance that Helmholtz put forward, analysis takes place in the cochlea: "Each of the twenty-four thousand fibers of the basilar membrane resonates in relation to a given frequency and communicates its vibration to the nearest nerve fibril," such that analysis takes place within the inner ear, prior to being sent to the brain.[5] Second, there was the so-called telephone theory, formulated by William Rutherford, which took off from the notion that each and every hair cell could be excited by each and every frequency, and that therefore the auditory nerve then transmits to the brain a nervous message that, in its frequency and its form, exactly reproduces the sonic vibration and that thus works like a telephone line.[6] In this theory, the analysis of sounds takes place in the central nervous system. Third and more recently came the theory of the *volley*, which is based on the notion of the simultaneous functioning of several fibers that "discharge their nervous influx in a single salvo or volley" (see E. G. Wever, *Theory of Hearing* [1949]).[7] This theory attempts to resolve the enigma created by the fact that the rhythm of auditory influxes can represent both pitch, in one part of the scale, and intensity.[8]

Thus, after an aerial voyage (up to the tympanic membrane, if it is a matter of audition from air conduction), becoming next solid or "mechanical" (along the series of ossicles), then hydrodynamic in the cochlea: "The wave propagates in electrochemical fashion from the vibratile hair cells to the cerebral cortex, via subcortical or so-called inferior centers."[9] "The influxes

thus follow very complex journeys," continues Claude Bailblé, from whom I cite. "Ascending lines and descending voices interconnect, while regulatory loops endlessly react to one another."[10]

Some Questions of Sonic Perception

With regard to our senses, one could for a long time assume that perception is perception of an objective physical reality, and it was sound, intangible and fleeting, that provided the best purchase for this schema because of the fact that the sound wave, when it takes off from a guitar string, can be seen and touched, and thus appears to constitute a quite concrete physical reality that is available to our visual and tactile senses—a reality of which sonic sensation would be the audible and volatile translation. The temptation becomes great to refer sound to a tangible source in order to "objectify" it. It was next recognized, however, that auditory sensations are not the simple report of variations in their vibratory causes. At this point, the temptation became to find the "law" governing this correspondence of stimulus and sensation.

It was long thought that the celebrated formula called the Weber-Fechner law ("a sensation grows in logarithmic proportion to the stimulus"), which was extended moreover by its formulators to cover various sensations, was particularly applicable to sound and, above all, to the perception of pitch. Isn't the geometric progression of pitches perceived as an arithmetic relation, since between a sound with a periodic vibration of 220 Hz (A below middle C) and a sound with a periodic vibration of 440 Hz (A above middle C), just as between a sound with a periodic vibration of 440 Hz and another at 880 Hz (the next A higher), the interval that we appear to perceive is the same, that is, an octave? As we shall see later, doesn't this hold for intensity too? Yet further studies have shown that this law, which simplifies matters quite a bit, only holds for middling acoustic frequencies and intensities alike. The easy accessibility of vibrations that produce sonic perceptions—if not always in relation to our other senses, at least in relation to simple devices (capable of measuring or of determining the frequency composition of a sound, as well as the amplitude of its wave)—serves as a permanent incitation to compare, as "cause" to "effect," what we call the sound wave (verberation) and what we call sensation, and to stubbornly try to find simple laws of correspondence between them. This comparison has brought with it a few surprises.

Perceived pitch therefore does vary with the frequency of the wave but within certain limits. These limits are not only those of the human ear, which roughly and with significant individual variations that are due mainly to age, range from 20 Hz up to 16,000 Hz (for young ears). These limits will also be found in the preferential sensitivity of our ear to certain areas in the field of pitch. Just like nuances in color are only optimally perceived under specific lighting conditions, the ear hears nuances of pitch much better in the middle zone (particularly between 800 and 4,000 Hz) than in the extremes of bass and of high pitch. Moreover, audition is easier and more detailed at a low or moderate sound level than at an elevated one. And there's more: contrary to what had been thought, an octave is as a rule perceived as shorter and more compressed in the high range than in the middle. The need to take this phenomenon into account has led to the creation of the strange "mel scale" (the term derived from "melody"), which superimposes onto the scale of tones and semitones another space of pitches, which is curved and compressed at the extremities.[11] An extremely high-pitched octave consists of fewer "mels" than an octave in the middle range, and it is thus shorter. When we hear a piece of music, we compensate for this deformation, a bit like we compensate mentally for the flattened perspective of an object seen from the side or from below. As we know—particularly since Erwin Panofsky's *Perspective as Symbolic Form* (1927)—some ancient architecture was calculated in relation to the point of view of an observer at ground level, and this led to compensation of foreshortened perspectives by variations in the diameter and spacing of a building's columns. If there are no musical systems based explicitly on the "mel," musicians have nonetheless long known from experience how to play on this "curvature" in the space of pitch.

Moreover, the ear, on account of its internal functioning (the mechanism of auditory analysis), hears very well fundamental frequencies that do not physically exist but that are constructed out of harmonics (i.e., out of secondary vibrations and integer multiples of the fundamental). It is at this point that two different logics come to oppose one another. The first, hitched onto the schema of cause and effect, would like to see in this perception of a pitch not caused by an external physical vibration a case of "acoustic illusion." The other, which post-Schaeffer I have strongly endorsed, holds strictly to what we hear. Or rather, it maintains that what several human beings who have not been conditioned to do so hear in concert as sufficient guarantee of objectivity proper. According to the second logic, the question of illusion is never raised. The pitch that is heard is objective.

But it is the matter of intensity, which in principle is a function of a signal's amplitude and of proximity to the source, that best illustrates the difficulty of determining "objectively" certain criteria and that explains why we often hear it said—exaggerating and extrapolating, in other words, wrongly—that sound is perceived in an individual and subjective—if not random—fashion. It must be said that certain people have done nothing to sort these problems, and to this day in many reputedly serious works, we are transported without warning from the matter of intensity as such to the matter of how loudness (necessarily varying by context and by person) can induce discomfort or be a form of violence. Entirely typical in this regard is the uncertain status of the decibel, a unit of measure for intensity that is an article of faith when it comes to antinoise regulation and is also used to calibrate numerous electroacoustic appliances. Concerning this bizarre "psychoacoustic" unit, we might even say as a start—as does quite clearly the anonymous editor of *L'homme d'aujourd'hui dans la société sonore* [Contemporary man in the sound world]: "It's not a unit qua unity at all" but rather a "bastard, dubious . . . tool of quantification."[12]

What led to the creation of such an oddity was the preoccupation with developing a unit of measure that would take into account the functioning of human sensation: the relation between the weakest sound perceived by the human ear and that which produces pain being a difference in power ratio of several billion, it makes no sense to have recourse to an arithmetic scale to translate such an enormous range of variation. The decibel scale, which is logarithmic, allows for quantification while sticking to reasonable figures: "What follows are unaccustomed relations between numbers," and so, "in order to express the doubling of the strength of a sound, it suffices to raise the decibel level by three."[13] The problem is that what we call sensation does not quietly obey Fechner's law, and this is particularly so for sounds. Moreover, the sensation of intensity is made up of a number of components, including temporal notions, criteria related to variations, and leaps in contrast. The compensatory physiological mechanisms aimed at protecting the ear also "falsify," if I may put it this way, the assessment of intensity.

To this we must add that the ear does not have a homogeneous response curve across the entire spectrum. In other words, if a variation in intensity occurs in certain regions of the spectrum, this variation will not be heard as strongly as it would in other regions: "Whence the creation of new units of measure such as the A-weighted decibel or dB(A) that are intended to take into account the response curve of the ear."[14] We are faced with exactly

the same problem that would arise if we wanted to create a unit of measure for light intensity while simultaneously wanting to take into account phenomena such as the effect of sudden flashes and contrasts, variations in pupil dilation, and so forth. This comparison is valid with the exception of two differences: on the one hand, the range of variations in sonic intensity is considerably larger than that of variations in luminosity; on the other, the ear cannot protect itself from intensity as easily as the eye can from light, lacking the equivalent of dark glasses or filtering lenses for sounds that are too loud, let alone of eyelids.

I must also point out the existence—established by numerous experiments—of a minimum temporal threshold for sound perception (forty milliseconds) below which the ear hears a mere "pop" or nothing at all. Because sound exists only in time, this temporal threshold is not at all the same as its equivalent with respect to vision. Since time is like space for a sound, it is instead comparable to a threshold of spatial resolution. Thus, just like a given point within a spatial figure is not in the least a reduced image of the figure as a whole, an isolated temporal point taken from an unfolding sound does not at all contain the properties and the form of that sound.

The causalist perspective combined with the almost always contextual and interested nature of audition—"What is that?" "Where is it coming from?"—leads us to associate with many sounds that we hear in daily life consideration of where they originate in space. The localization of a sound source, insofar as it is possible, is a phenomenon that has been studied with special attention with respect to "pure" cases. It has been confirmed that localization makes use either conjointly or separately of differences in intensity and differences in the arrival time of the sound wave at each ear. In fact, a wave that comes to us from the left-hand side will arrive with more strength and sooner at the left ear than at the right ear. Monaural localization, that is, with a single ear, is also possible in certain cases by shifts in head position, which allow the pinna to create lags out of reflections on the lobes. In addition, localization can entail an internal activity, with the result that "pricking up one's ears" is not a mere figurative expression, albeit the muscle movement takes place out of sight.[15] When someone has a particular interest in hearing something on one side, the tensor tympani allows for the localization of the origins of sounds: "In so doing, the signal at the side of interest is augmented, while noise, which arrives at both ears, is subtracted from the other side."[16] A little unconscious head movement, which allows for the comparison of messages received at each ear, also helps to localize sounds.

We automatically position ourselves facing sound sources, even when it is a matter of loudspeakers. That is, we place sounds in what has been called our "cone of awareness," that is, the spatial zone situated in front of us. It has been remarked that ocular movement reinforces auditory localization, but it is not simply a matter of localization but of listening: we hear a sound that comes to us head-on better and in more detail than one that comes from the side. That being said, in many instances in which what I call *spatial magnetization* comes into play, it is the sight of the source that "captures" audition and that dictates the feeling of localization. We hear the sound *from where we see it coming*—actually, even from where we *know* it to come rather than from where it does arrive. This presupposes that the two localizations—the one established by sight and the other furnished by audition—do not always match. This is quite often the case, for example, when a sound is variously reflected by walls or other surfaces. Another example would be when a loudspeaker emits a direct and amplified sound at, say, a lecture or meeting or in relation to a film projected onto a screen. In the latter case, we can very easily follow a film where the sound comes from a speaker situated behind us or via headphones. We experience this headphone phenomenon on long-haul flights, where we mentally project the sound of a film onto the video monitor closest to us—provided however that the sound doesn't "wander" in space. Indeed, the example of films in Dolby stereo, where sound can move from one speaker to the other, provides the counterexperience. In this case, the ear becomes resensitized to the real acoustic localization of the sound as soon as the latter is mobile, turns, shifts from left to right, and so forth. If it comes from a fixed position, the sound is less easily perceived as coming from a certain direction rather than another, and it once again becomes "magnetizable" by the visible source, be it real or imaginary. This confirms the existence of specialized sensors in the auditory system for the perception of movements in space, like those that exist for peripheral vision.

The result of this is a considerable paradox, and one that I was the first to highlight: when a sound comes from a fixed source, it is easily magnetized by what we see or what we think we know, and it tends to lose its autonomous spatial anchorage; when it moves in space (as with the buzzing of a fly in a room or sounds shifting from one speaker to another in a multitracked film or in a multichannel recording), a sound is much more easily localized in terms of real—albeit fleeting—position in space, and this is so *precisely because the place from which it comes is constantly changing*.

The sound world—and this is one of the ways in which it differs from the visual world—is marked by the idea of competition and of potential reciprocal disturbance among different sounds in spatial cohabitation. In particular, there is the "masking" effect among sounds that are otherwise separate. This is an effect that does not hold for vision, except in very limited instances (e.g., being dazzled by a luminous object). This asymmetry flows logically from the physical character of sonic signals, which disperse in space. This character does not allow us to focus on a single sound while forgetting simultaneous and contiguous sounds. The spatial ordering of visual phenomena, which means that an object visible to my left does not disturb my perception of an object appearing to my right, does not have an equivalent in the sonic domain.

Furthermore, *bass sounds mask more than high-pitched sounds*, and this is not without consequence with regard to the physiology and functioning of the ear, which must be adapted to compensate somewhat for this phenomenon, or with regard to musical composition. When handling orchestration, composers have long known how to take these effects into account. With this in mind, for example, in a symphony orchestra the number of violins is multiplied, and they are placed up front in order to prevent their parts being masked by the timpani.

One grasps the masking effect when caught among several simultaneous conversations. It has been used in cinema for dramatic or aesthetic effect. It can be compensated for or combated in various ways. For instance, if you want to make yourself better heard, you can speak more loudly or raise the pitch of your voice. You might do the latter when close to a waterfall or to a noisy machine in order to get out of the zone of the masking frequencies. This is illustrated in several film scenes—the first encounter in the factory between Jean Gabin and Jacqueline Laurent in *Le jour se lève* [*Daybreak*] and several battle scenes in Coppola's *Apocalypse Now*—although by contrivances such as multiple microphones, close-ups, or mixing, certain films have acted in defiance of the laws of acoustics and have shown us characters who speak calmly and hear one another marvelously amid a total din. On the other hand, the famous "cocktail party effect" allows an auditor—all the while hearing masking noises—to extract from the hubbub of conversation one voice out of many.

The masking function of certain sounds is not just a bother. On the contrary, it is sometimes a comfort. Claude Bailblé makes humorous mention of the fountains of Versailles, where confidences could be whispered without the risk of being understood by rivals or husbands. I might also evoke the era when trains were less well soundproofed than today and when their rumbling enabled intimate conversation.

What is rarely mentioned with regard to the "cocktail party effect"—so named after one of the social settings in which it is quite helpful to be able to put it to work—is that it is a heavy consumer of attention and therefore tiring. Moreover, it works best with sonic chains that are organized according to a preestablished system. For example, it works with spoken words or tonal music, where one can mentally "recover" what cannot be heard. Finally, the "cocktail party effect" benefits quite a bit from nonsonic information that lets one fill in auditory holes, such as the lip movements of the speaker whose voice is drowned in the hubbub. When it is a matter of a nonverbal signal or a nonmusical signal—or at least one outside of traditional musical systems—it is more difficult. I consider it exceedingly doubtful that this effect works just as well on noncoded sounds.

The problem of masking is clearly caused by the impossibility with regard to listening, of framing—that is to say, of completely excluding a sound from the auditory field. There is actually no frame for sounds in the sense that word has for the visual register, namely, *a container with borders that delimit at the same time that they structure what they enclose*. This assertion that *there is no sonic frame for sounds* has entailed an entire chain of consequences for my theory of audio-vision (these consequences are explored in detail in my book *Audio-Vision* and are summed up in chapter 10 of the present volume).

Besides the "cocktail party effect," so-called informed listening puts into play a group of behaviors and compensatory systems that together "help" listening better get at what interests it. At the same time, they render listening impossible on the plane of strictly objective observation—of reporting what has been heard. Let me cite the example of "recovering," which has us, so to speak, filling the holes of an incomplete verbal or musical message by drawing from our stock of already learned forms and models. That which helps us hear a particular signal prevents us from objectively hearing the totality. This also holds for those "perceptual constants" that, as Bailblé nicely puts it, "stabilize the identified object—the constants of timbre, of size, of the object—and protect its image from the vagaries of perception and fluctuations

of capture: spectral drift, variations in intensity, momentary masking. The fragile image—in its native state—recruits a double from the atlas of possible sounds (auditory memory). The result is that, in spite of flaws in the signal, the auditor *hears in fact a hybrid* situated halfway between the perception and the already known (which locks the image in place)."[17] All well and good, but what happens when this double pertains to an initial listening to a given recorded sound? Is the sound superimposed onto itself? This opens up an entire region of new questions that I will treat in due course.

Perception is actually three-quarters preperception. As we grow up and then grow older, what we hear is increasingly inscribed in an entirely prearranged grid. If it were otherwise, everything we perceive via the eyes, ears, body would constantly toss and roll the world around us. All the same, we understand that this stock of familiar and fixed forms prevents us from precisely hearing each sound as is. Natural listening and listening as a mental or artistic exercise, centered on particular objects, are not the same. But the latter can superimpose on the former an entirely new conditioning. Thus, the deconditioning exercise of naming or active verbalization creates a new type of preperceptual expectation and a much more elaborated structuration of listening. Just as there are with regard to painting tricks that may be used to combat routine pre-vision and reteach us to see—looking at a familiar landscape that has been flipped upside down or using a mirror will reveal new aspects—there are tricks for hearing. But the difference is that these only apply to sounds capable of being reheard and, thus, to fixed sounds. But hearing *what* exactly? Doesn't everything that I have already remarked show that sound—now with the meaning of *that which one hears*—seems off to a bad start as an object? Is this so because we systematically listen in the past tense?

3))) Sound and Time

A Lasting Presence

To open this work I called on Racine and Hugo. Let me now turn to Stéphane Mallarmé, who throughout his oeuvre is literally haunted by sounds that have taken place, so much so that he makes this the entire point of departure for his unfinished dramatic poem *Igitur ou la Folie d'Elbehnon*. In this extraordinary draft, what is at stake is a collision, grazing, shock—a sonic index of presence that is, now that it is no longer heard, as if written in eternity. One of the versions of the text begins with the phrase "Certainly subsists a presence of Midnight."[1] Mallarmé speaks of a "beating heard, of which the total and denuded noise forever fell into its past," as well as of a "panting that had grazed this place."[2] This accentuated noise and grazing seem to reverberate infinitely within the one that they have marked: "It was the scansion of my measure, the reminiscence of which returned, prolonged by the noise in the corridor of time of the door of my sepulcher, and by hallucination."[3] Lines such as these are less to be interpreted or glossed as grasped in terms of their effect of endless repercussion. In the same way that the genitive constructions ("of time," "of the door," "of my sepulcher") cascade one after the other, sound once heard repeats forever in that which one dares not call memory. It comes as no surprise that for Mallarmé sound, the void, and the present perfect are always tightly linked, as in these lines from one of his most celebrated sonnets:

> . . . no ptyx,
> Abolished curio of sonic inanity
> (Because the Master *has gone* to draw tears from the Styx

With this sole object about which the Void feels pride.)

[. . . nul ptyx,
Aboli bibelot d'inanité sonore
(Car le Maître *est allé* puiser des pleurs au Styx
Avec ce seul objet dont le Néant s'honore.)][4]

In Ingmar Bergman's *Through a Glass Darkly* (1961), the character Karin, played by Harriet Andersson, pauses in her stroll with her younger brother to say: "Shush! Did you hear? That was a cuckoo's call." Her brother had not paid attention to it, and neither had we. It was perhaps ordinary, but like many sounds, it was only a fleeting event, and since out of the two characters—make it three if you include the viewer—a single one, Karin, noticed it, this humble sound is now suspect of being a mere hallucination. Every passing sound is marked with hallucination, because it leaves no traces, and every sound can resound for all eternity in the present perfect of listening.

The famous episode of the "frozen words" in Rabelais's *The Life of Gargantua and Pantagruel* has often been evoked as a premonition of recording, yet it has perhaps a much more ancient and general value, which is to tell us that sound is always lagging or that we are always late in coming to it—that there is always something about audition that is after the fact [*après coup*]. It is in the fourth volume of the work that we find this episode, inspired by Plutarch, and in which Panurge, Pantagruel, and their companions navigate a northern sea where they hear strange sounds without visible causes—acousmatic sounds. We learn that these are sounds and speech from a great battle that took place on this spot during a year so cold that the sounds had been frozen in place.

A strange hesitation between sounds and voices is manifest throughout the sequence. Sometimes it is only a matter of the vocal sounds of women, children, and men, who speak in a "barbarous," incomprehensible tongue. At other times, there is the sound of weapons, drums, and fifes. But when the sounds thaw and are heard, Rabelais clearly speaks to us of "frozen speech" and "words," even if these words denote the sounds of scuffle and collision, as if the conversation among noises had to pass via the stage of onomatopoeia and language. For instance, Rabelais speaks to us of a word that, when reheated in the hands of Friar Jean des Entommeures, makes a sound like "chestnuts thrown in the fire without having been cut," and Panurge then makes the diagnosis that this was "in its time" the sound of an artillery piece. Next, Pantagruel throws some frozen words on the upper deck of the

ship that have the appearance of "sugared almonds, shimmering with various colors." When these melt and can be heard, they release sounds like "*hin, hin, hin, hin, his, ticque, torche, lorgne, bredeдin, brededac, frr, frrr, frrr* [. . .] *traccc, trac, trr, trr, trrr, trrrrrr, on, on, on, on, ououououon*," and so forth.[5] The author refers to them with feminine pronouns and adjectives, as for speech, and with masculine ones, as for noises.[6] How not to think that this visible and colored speech that "makes sound when thawing" is not so much the sound as the written word itself, the onomatopoeic coding of the sound that renders it capable of preservation?

All the same, the fact that these frozen words or sounds appear and disappear in time makes it impossible for us not to think of the idea of preserving sounds themselves. Notwithstanding, what we might see here in retrospect is not what is at stake. Rabelais's frozen words are not in fact what I call "fixed" sounds. They are simply sounds deferred and heard after a temporal gap (like a sound heard in the distance and that comes to us with a lag). Not only do the sounds of the battle ring out only once when they melt and then disappear forever, but they were also not heard the first time, having been frozen in the air. The comparison with preservation in ice extends further when Panurge envisages preventing some of these words from melting by keeping them packed in hay. In other words, for him it is a matter of deferring the audition of a sound and not of repeating it over and over. The principle of sound's perishability is still assured; it is simply a matter of putting it off.

The Memory Trace of the Traceless

Rainer Maria Rilke writes: "Manchmal schreckt ein Vogel und zieht . . . weithin das schriftliche Bild seines vereinsamten Schrein." Translated from the German: "Sometimes a bird startles" and "extends into the distance the written image of its desolate cry."[7] What is this written image? It is the memory trace of the punctual sound. It is precise, and at the same time, that to which it corresponds—that which it so precisely contours—is forever erased, whereas its trace is forever inscribed. At least, this is the case until the recording of sounds enables us to preserve something of them. And yet, if sound becomes repeatable with the help of a medium, it continues to require time to lay itself forth once again, and we are never sure to have heard it properly. Japanese haiku often make allusion to such sonic events, of which the furrow alone is inscribed in memory. These brief poems, laid down and

inscribed in an instant, are themselves such *schriftliche Bilder*, or written images.

Sound is often the detritus—the poor cousin—of attention, which is marked as guilty for not having heard it rightly. "Noon rang out at the moment that the ring fell," says Pelléas to the princess Mélisande in Debussy's opera. She is sorry for having a minute earlier dropped her wedding ring in the fountain. We, who were following the scene, had not paid attention to the bells. And if we listen to this opera that the composer adapted from a play by Maeterlinck, we must search the score or a recording to find the sonic trace of that very precise midday moment, when the ring sank. Debussy—who was so sensitive to the passing of the hours—knew what he was doing when he transcribed with great discretion the sonic indication that the character gives: at the moment when Mélisande drops her ring, he has the harp sound twelve unobtrusive notes, which are only heard at the limits of our attention, such that one cannot even count them. These twelve strokes of noon in Debussy are a good example, like Mallarmé's midnight. When we hear them and we count them, and when they don't add up to twelve, we are often unsure whether we missed one of them or not.

The Speed of Sound and Synchronism

We read in the philosopher Porphyry (234–305 CE) about a strange theory that he attributes to Democritus. According to this theory, the image of lightning is perceived before the sound of thunder—an old observation, which has long led to the conclusion that sound is slow—because sight goes out to meet the luminous phenomenon and covers part of the route, whereas hearing behaves passively. Hearing would be "a noise reservoir that awaits sound in the manner of a vase" and "into which sound creeps and flows."[8] We recognize here a feminine conception of hearing as orifice. Later, in his poem *De rerum natura*, Lucretius notes that "sounds destined for our ears make their path more slowly than those images that move our vision." He provides as illustration not only the storm but also the example of the "woodcutter, seen from afar, chopping with his double-bladed axe the wiry trunk of a tree: you see the blow before the sound of the impact arrives at your ear" (bk. 6, 11. 160–72).[9] Today, when sound is recorded and reproduced, is there still an after-the-fact of sound and an after-the-fact of hearing? I am tempted to say yes.

The Time of Listening and the Time of Sound

In principle, in the era of fixed sound, the time of listening should no longer be of any importance and nothing more than the time of a playback or track. The time of a sound—the time that cannot be decoupled from it—should become independent of the time of listening to it—a time that can be implemented over and again. Yet because sound can be recorded and replayed does not make it utterly lose its quality of event, ripping through the silence, surging forth. First of all, the majority of sonic events continue to be produced a single time and are not recorded (what would we do with them if they were?). Second, a sound must be replayed in order to be reheard, thus setting into motion once again a movement of loss and passing—a repetition that at the same time involves the fixing and recording of something . . .

We can call the duration, which varies depending on the nature of the sound, that delimits what we can possibly apprehend as a sound from beginning to end as a global form taken up in the "blink of an ear," the *temporal window of mental totalization*. This duration of totalization, which on average does not exceed a few seconds, cannot be defined in too rigid a manner. In fact, an isolated piano sound, which lasts a long time if you follow it to the extreme limit of the extinction of its resonance, exceeds as a rule by quite a bit this average duration of totalization, and yet it is inscribed within this average because the global shape of its form is grasped in less time than it takes for it to play out to the end. In other words, its end is but the logical completion of its beginning, and the sound is totalized before it is truly completed.

Certain visual forms can only be apprehended by taking a step back—that is, in very concrete terms, by physically distancing oneself from the object—in order to let vision totalize them. But what to do with a sound that lasts a given number of seconds, if that duration exceeds the temporal window of mental totalization? To compress such a sound, a possibility that was long dreamed of and has become easily enough doable with the advent of computing, by applying the principle of sampling (by which is meant in this instance the drawing off of very short fragments that are then brought closer together) does not resolve the problem. In fact, you then realize that a sound that is temporally compressed beyond a certain threshold changes in timbre and thus in identity, a bit like if one decided to distance oneself from an object or a mountain in order to study it, and the object or mountain at the same time totally changed proportions—which moreover happens with mountains, but in their case, according to the angle and distance.

Since every sound must exist in time, the perceptual circuit poses radically distinct problems for visual objects and sound objects. To get an idea of what sonic perception entails using an analogy, consider what it would be like to voyage in a train going at high speed, the interior of which is completely dark, and—in the case of sounds that are fixed and can be listened to over and again—running on a circular track. All you can do is watch the countryside from the windows, and you would of course see objects speeding past. This would allow you to make out recurrent and repeating forms, certain objects, with the closest ones—trees, houses—going by more quickly than others, such as the outline of mountains or the horizon in the distance. It would be difficult, however, to observe one house among others because it would pass by very quickly, such that you would tend to only retain certain salient and statistical characteristics shared by all these houses or all these trees—along with, from time to time, a significant detail. The capacity for re-listening or what might be called multi-audition that fixed sounds allow is not like filming the countryside and then being able to watch it over in slow motion. Rather, what it allows is taking the same trip over and over at will, but with very precise constraints. In particular, the train always goes at the same speed, and thus, with effort, you can make out such or such house, although this will always remain to be verified. Further, the voyager will not be allowed to take photographs, but may make films of the journey, and these films will not be capable of running at slowed speeds or of freezing on an image. I use this convoluted analogy in order to remind us that you cannot stop on a sound.

Notwithstanding, one can say that a portion of that which constitutes our sonic or musical perceptions pertain to an "extratemporal" structure. What this means is that while inevitably unfolding in time, they occupy time in a free or elastic fashion. Take, for example, the case of a chorale in classical music, that is, a melody with a somewhat slow and equal rhythm that is accompanied by homophonic chords (one chord per note). This typical structure has been much used in Western art music, and it holds a particularly important place in the Romantic symphony.[10] Whether such a chorale is enunciated as fast as possible or with a very slowed-down tempo, we recognize it and confer an identity on it. In this sense, it requires time to be enunciated but occupies time as if it were space. This also often goes for jazz "standards," such as "Sophisticated Lady" or " 'Round Midnight." Certain aspects of sonic structures, such as the melody, harmonic sequences, or certain sim-

ple rhythmic schemes, can thus be to some extent expanded or contracted, and a moderate change in time scale will leave their identity intact, whereas other aspects of sonic matter, such as grain or speed, are more closely tied to a precise duration and are thus as uncontractible as they are untransferable.

Sound does not narrate the time of its duration. It can narrate—or not—*another time* and, indeed, in some cases, the absence of time itself. Herein lies the apparent contradiction in children's drawings in which some sounds, all the while unfolding linearly, inspire circles, spirals, or whirls. They hear a sound that develops in linear time—time without return—but what it *tells* them is often time in the form of a circle or spiral. Thus the drawing faithfully shows not the time of the sound but rather the time told by the sound. Moreover, we must not interpret these renderings in terms of a total, already given image, but rather as a line showing a movement in formation. Of course, such a drawing exists in space, but we must not "read" it as already completed but as in a state of creation and of motion—the dynamic motion of the line. Making this clarification has become important ever since the time of unfolding of a sound seems to have become objectified on recording media—since it has been rendered accountable, mapped, enclosed, and decomposable into temporal atoms, in the form of either little strips of magnetic tape or bits of computer memory. Or, indeed, since it has been made visible via sonographic mappings on a computer. Henceforth, it has been possible to believe that it is enough to follow a sound step by step in order to comprehend its temporal form. But this is not so.

Contrary to written communication, which we can read at whatever speed suits us—unless we are talking about an electronic bulletin board or subtitles—sonic communication, particularly verbal and musical, imposes its duration on us. For centuries this fact has had as a consequence that the ear is often offered a second chance, if one wants the message missed the first time to have an opportunity to get across. In music, this second chance goes by the name of refrain, ritornello, or reprise. For example, all the little movements that make up Johann Sebastian Bach's orchestral overtures and his keyboard partitas—or, for that matter, Domenico Scarlatti's hundreds of harpsichord sonatas—adopt the form of a double textual repetition that follows the schema AA/BB. Put another way, each of these movements is divided into two sections, each of which is repeated in its entirety. Until the middle of the nineteenth century, the first movement of a symphony or of a sonata consists of repeats of the part known as the "exposition"—not

to mention the case of the scherzo movements (dancelike sections of the symphonic form), which are based on numerous textual repetitions. This enormous redundancy—which means that if we buy a recording of Bach's English Suites that lasts an hour, we only get thirty minutes of "pure" musical information—clearly has no equivalent in the visual arts of the period. By this I don't have in mind decorative motifs, but paintings, scenes, and so forth, to be viewed at one's leisure. Even the strong redundancy that we find in traditional poetic forms (refrains, rhymes, etc.) does not go to such lengths.

Missing a Sound

As Jacques Ninio stresses, there is such a thing as auditory working memory: "Consider this exchange of questions and answers: 'Do you want me to make you a glass of lemonade?' 'What did you just say?' 'Do you want me . . .' 'Oh yes, a glass of lemonade.' The repetition of the first part of the question ('Do you want me') has allowed the entirety of the submerged message to emerge into consciousness."[11]

Still on the topic of missing a sound, we don't hear an appearing sound and a disappearing sound in the same way. The experiment is easy to carry out. We have our test subjects hear a fixed percussion-resonance sound (maximum initial intensity followed by extinguishment, as with a plain old piano note) and then another sound that is simply the temporal inversion of the latter. With a reel-to-reel tape player, you merely reverse the direction of the medium; with a computer, a data-processing function can give you the same effect. Next, compare the various estimates that our auditors give of the duration of each of these two sounds—durations that are chronometrically identical. As long as the test subjects have not already undergone such an experiment and already understand the principle, chances are very good that sound number two will be perceived as lasting noticeably longer than the first. Why? Because the first sound tells the story of a disappearance, while the second that of an appearance.

The natural sound of an isolated piano note, which dies off into silence, is hard to listen to up until the final disappearance of its resonance. Soon enough, we hang up, treating it as already finished. The same sound inverted, which takes the form of slow building of intensity and disappears as soon as that intensity reaches its maximum, will be listened to much more actively and continuously, and so it will seem longer. Very few listeners will hang

onto a decreasing sound to the end, unless it recounts a loved one's departure. On the other hand, the phenomenon of a sound going back to front never ceases to engage our interest. Actually, a piano sound going backward is the image of something that could be dangerous to us. It represents that which might grow infinitely, covering up all other sounds, invading us, submerging us, and disarming us—all by preventing us not only from hearing but also from making ourselves heard. Listened to over a loudspeaker, a sound that grows is worrisome for this reason. With this listening effect in mind—an effect that inheres in the use of speakers—it is perhaps helpful, at the outset of a working session on sound, to briefly transmit a test sound produced at the maximum strength that the technical facilities allow. You will have thus defined the peak intensity beyond which the sound should not pass. You must be sure, however, that you can do so without disturbing those in the neighboring rooms, or at least warn them in advance!

Because of the fleeting character of the majority of sounds that we hear, it is impossible for us not to selectively hear as we go. But if we are working with fixed sounds, this allows us to enlarge the listening field and to resituate what we are hearing within a greater whole (e.g., we can stop focusing on a specific conversation at a dinner). At the same time, the acoustic, psychological, and other givens of a live listening situation compared with listening via loudspeakers—even in stereo—are completely altered. Further, even in the case of repeated listening, it is by definition impossible to know if we have unconsciously left out a given sound, such as a car passing in the distance, some noise caused by the heating or lighting systems, and so forth. Why isn't it the same for that which we see? Because the number of things that we can see is finite and noticeably limited not only by the directionality of our gaze but also by the very nature of the visible. Thus, we can undertake a visual review of everything that is possible for us to see in a given place, and if we miss something—if we don't "see" it—we nonetheless know that it is located within the field of vision itself.

The way that vision works, in conjunction with the nature of the visible, permits a constant back-and-forth between detail and whole, for purposes of verification. The visible is inscribed within imbricated, concentric spaces, the outlines of which can be located. A large majority of visible things remain constant, whereas a large majority of audible things are temporary. This much is incontestable and makes even much more significant those cases where a visual object is, to use a common expression, "staring right at us," that is, it is not seen by us in spite of its obviousness, as in the Edgar Allan Poe's "The

Purloined Letter," to which Jacques Lacan dedicated his famous seminar.[12] It is of course because the purloined letter is still there that this story is so revealing. Its acoustic equivalent—the not-heard phrase—does not have the same signification at all.

Not without a reason lurking behind the apparent paradox, the same Lacan goes as far as to say that the proverbial saying "*Verba volant, scripta manent*"—"Speech flies, writing remains"—ought to be inverted. That which has been said has been recorded and remains decisive for certain destinies, without any need for conscious attention. In parallel fashion, that which is beyond conscious attention and naming—the texture of a sound, its consistency—has no less of an effect. The already heard [*déjà-entendu*] repeats itself in circles for eternity in the present perfect of listening.

Cessation, Awareness of the Already There, and Recapturing in Flight of an Already Past

The raw winter wind
Has died down leaving only
The sound of the sea
—Ikenishi Gonsui

A sound has stopped, for example, ambient music or an air conditioner. I was not conscious of it, but now that it has ceased, I realize that it was there. The cessation of a sound often allows us to become aware of it afterward, at the same time that its cessation sometimes reveals a hidden sound, itself already present, but previously either masked or audible yet scotomized. So it is with those sounds of which André Gide speaks in *Les nourritures terrestres* [*The Fruits of the Earth*]: "And the song of birds on summer nights; and then those same birds, at moments, fall silent; and then you hear very faintly the sound of waves."[13] This raising of the curtain on another sound that had been hitherto masked would seem potentially infinite: each sound, no matter how faint, is the very curtain that veils from us other unheard sounds, whence doubtless the fantasy of an absolute silence that would awaken the voice of all voices, the mute voice, concerning which Lamartine says only angels hear: "The unanimous concert of celestial wonders / Rolling with grand harmonies in the silence [L'unanime concert des célestes merveilles / Roulant dans le silence en grandes harmonies]."[14]

Listening in Accordance with Time

If we listen to a two-minute sequence, we notice that we concentrate on what we are hearing with a certain amount of difficulty if that sequence is not structured. This is the case, for example, with a two-minute ad hoc recording of a crowd, of urban background sounds, and so forth. We detect a detail, but did we do so during, before, or after we heard something else? We cannot say. Here, details are like fruits gathered from a tree: from which branch or from what height, we no longer know. We must notice the difficulty of structuring in time what we have heard, even simply in terms of chronological ordering. We can reckon that various factors have an influence on the sensation of time and thus that they also have an influence on our attention while we listen, as well as on our memory and on the temporal structuration of what we have heard. Among others, these factors include:

- The foreseeability or unforeseeability of phenomena. These either allow anticipation or deny it, and thus allow one to project more or less into the future according to a temporal vector (foreseeability linked to a law that is either perceptible or not in the unfolding of phenomena: progression or extinction, and so forth).
- The presence or absence of temporal points of reference, metrical markers, jingles, characteristic and repeated motifs, very assertive temporal articulations, shocks that punctuate time and inject a vertical moment into it, introducing separate stresses into listening and providing a certain apprehension of the total form.
- The acuity of sonic events, that is, the relative amount of rapid and high-pitched phenomena that they contain and that impose on our attention an attitude of immediate vigilance, providing this attitude with a relatively heightened sense of "being on the edge of the present" (it would appear that high pitches mobilize this type of listening more than bass sounds).
- The synchronization or nonsynchronization of rhythms in the sonic sequence with those other, *ultramusical* rhythms that guide our sensation of time: macro-rhythms and micro-rhythms characteristic of natural phenomena, physical and bodily rhythms, and so forth.

By *ultramusical* given, I designate any given found outside or inside of music, the field of existence and relevance of which goes beyond that of music all the while subsuming it. I use this term in opposition to *extramusical*, which

is often used today and which on the contrary excludes music from the field in question. For example, rhythm or the dynamic schemes that Robert Francès has studied in relation to music (arsis/thesis, acceleration, deceleration, etc.) are typically ultramusical elements.[15] Moreover, certain ultramusical rhythms such as respiration (ebb and flow of the sea) have the ability to render duration unreal, making it escape linear time. A bit like some flat, desert landscapes through which trains pass: they don't make perception of a before and after easy. A lot of contemporary dance and trance music are also not favorable to sound-by-sound listening. They undo time. At the other extreme, certain particularly metrical and finely chiseled works by Beethoven (e.g., the overture to *Egmont*) lay down a temporality structured with an unsurpassed clarity and firmness.

Musical, cinematic, and broadcasting sound sequences often provide what might be called a certain temporal tonality—the way in which time unfolds within them—that conditions our sonic attention over the short, medium, and long term. Let me mention a handful of these temporal tonalities, with the definitions that I have suggested:

- *Traversing time* is particularly characteristic of musique concrète and of film. It takes off from the preexistence in these chronographic arts of what I call *containing temporal space* (the preestablished time of the unwinding of the format). It is felt as distinct from the duration that covers that space, in order to link the passage of time to the feeling of the traversal of a space.
- *Frieze time* is characterized by a homogeneous distribution of discourse and of sonic events in time. The beginning and ending moments of a movement seem to be divided up in an endless continuum, even if a change might have been produced between the one point and the other. Frieze time prefers active and dynamic sounds in comparison to *shimmering time* (see below), which sometimes seems close to it. The hyperactive and crowded sound of some modern American films provides a prominent example.[16]
- *Shimmering time* generally plays on a certain number of rarefied and oscillating elements. Not aggressive but rather pleasant, these give the feeling of a spellbinding or riveting to the spot. Contrary to frieze time, concerning which one remains generally speaking an objective observer, here you find yourself captured and personally implicated—the relationship is one of seduction. Countless "enchanting" musi-

cal pieces provide examples, as do certain moments in the films of Tarkovsky.

- *And-so-forth time* is that time offered up to hearing as a sketch of temporalities that could be much longer and more developed. These sketched temporalities are exposed in a concise manner, by inserting silences and punctuation marks (often question marks) that let the auditor prolong the phenomenon in imaginary time. Chopin's preludes and Anton Webern's *Five Pieces for Orchestra*, op. 10, provide examples.
- *Hourglass time* comes last on this nonexhaustive list. This is time offered up to hearing as a drop-by-drop flow, as a process of disaggregation and evolution toward entropy, using procedures such as stressing resonances and unexpected turns (e.g., an abrupt silence), figures of temporal punctuation that evoke the counting of time, evocation of a void surrounding active, weak, yet delineated sounds, and so forth.

In all these instances, sound shows its power to influence our perception of time, and this is a power of which music and cinema make ample use.

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PART II • a divided world

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4))) Voice, Language, and Sounds

Sound, or the Voice as Reified Remainder

If ever there were a discovery made by the science of linguistics that shook up its fate and truly got it off the ground, it is certainly that language, in its oral form, does not have sounds as its foundation but phonemes. That is to say, language is based on a system of oppositions and differences within a certain distribution of sonorities. What Ferdinand de Saussure set forth in his *Cours de linguistique générale* [*Course in General Linguistics*] (edited by his pupils) remains, after all the subsequent acquisitions of modern linguistics, valid still: "It is impossible for sound alone, a material element, to belong to language. It is only a secondary thing, a substance put to use." The essence of the "linguistic signifier" "is not phonic but incorporeal—constituted not by its material substance but solely by the differences that separate its sound-image from all others."[1] This assertion is so true—and at the same time so little understood and appreciated—that modern composers who have sought to carry out work on language itself by starting with a text recorded onto a given medium from which they have isolated and reassembled phonetic fragments—as Luciano Berio did in his *Omaggio a Joyce*, starting from a few phrases from the latter's *Ulysses*—have never produced anything of significance. Soon enough, the phoneme isolated from the word becomes sonic matter, voice, noise, what have you, but it becomes separated from any linguistic belonging. All of the tension of the Joycean experiment, particularly in *Finnegans Wake*—that utopia—which is to get across the world and sound using something that at the same time remains part of language, dissolves into a sort of sonic Lettrism without stakes.

The granting of this very simple distinction between phoneme and sound, which you will find in any introduction to linguistics, continues to be ignored in much research in experimental psychology, wherein texts and isolated recorded words—therefore just sounds—are played for listeners and various conclusions are drawn as if it were a matter of phonemes, and vice versa. This gives us an idea of the extent to which disciplines treating sound are dispersed far and wide. A phoneme is not a sound but an abstract, differential unit. From this have derived two disciplines that have taken a bit of time to differentiate themselves: phonetics, which "studies the sounds of language in terms of their concrete realization, independently of their linguistic function," whereas phonology "studies the sounds of language from the point of view of their function within the system of linguistic communication."[2]

As further proof that language is far from sound, the great linguist Roman Jakobson taught us in his *Six Lectures on Sound and Meaning* (1942) that the traditional doctrine, which sought to understand the sounds of language by studying their concretization, was mistaken on this point: "Investigations have shown that it is not the acoustic phenomenon in itself which enables us to subdivide the speech chain into distinct elements; only the linguistic value of the element can do this."[3] In sum, phonetic units exist neither acoustically nor from the perspective of their phonatory production, facts that promise quite a jolly time for those who would claim to study sound at the point of its production, as well as for those who might wish to use linguistic categories in domains other than the sounds of language as a classificatory model for sound in general. Jakobson deduces from this that the study of the sounds of language from the perspective of their production does not have the importance that one trusting to good sense or logic might like to attribute to it. In a remark that in many respects could be extended to music, he writes of the belief among phoneticians "that the investigation of the *production* of sound, rather than of the sound itself, gave one the motor equivalent of the acoustic phenomenon," and that they assumed "a one-to-one correspondence between the two aspects" and that "the classification of motor phenomena has an exact equivalent in the classification of acoustic phenomena."[4] Jakobson gives several examples that refute this belief. As early as 1718, a certain Jussieu published a case study about a young woman who only had a tiny tip of tongue and who nonetheless was capable of "impeccable pronunciation of all the sounds which in phonetics nowadays are called the 'linguals.'"[5] Generally speaking, if "one of the phonatory organs is missing then another one can function in its place, without the hearer being aware of this."[6] This, Jakobson

explains, establishes, along with many other instances, the importance of the *audio-phonatory loop*—as long as we are talking about someone with normal hearing.

A certain formulation of linguistic theory presents language as based on a "selection" from a totality of possibilities made up of all the sounds that a human being is capable of making. We might call this the theory of *culling*. We thus read in the Larousse *Dictionnaire de linguistique*: "Every sound has characteristics of frequency, intensity, and duration, but these givens are not used in the same way in all languages. Each one carries out a *linguistic culling* according to different properties of the sonic material. In certain languages, for example, differences in duration are not used for distinct ends. Others, on the contrary, will make use of the fact that the emission of a sound can last a shorter or longer time in order to distinguish the signifiers of two messages."[7] The concepts of culling and adoption must not make us think of "sonic material" as a sort of preexisting reservoir from which we draw. Let me clearly state that there is no totality of sounds that preexists any system of communication or expression whatsoever. Sound reveals itself to us via a gradual elaboration not only with respect to languages but also in music, cinema, those arts that make use of it, and, of course, in reflection and theorization. There is thus much sound to create, and it is never totalized.

From the point of view of acoulogy, the linguistic context has the disadvantage—if I may put it this way—of making us insensitive when listening to a message to the important differences in the emission of a sound, in its "pronunciation." This insensitivity occurs as soon as these differences are not relevant for the given language. Language does not particularly help us to listen in *reduced listening* mode, because, for a language that we understand, we carve spoken words into phonemes (which are not sonic) and not into sonic units. If our interlocutor pronounces a phrase that consists of many phonetic, semantic, and other elements that are familiar to us and does so in a context that facilitates our comprehension of them, then it is literally impossible to hear it as it is truly pronounced. We hear the text rather than the sounds. If the speaker "swallows" a syllable or an entire word, we restore them quite easily. The only thing that we can extract from the sounds is the general melody of the voice and its rhythm, but each syllable as such is literally inaudible, so conditioned are we to hearing such and such syllable as necessarily occurring in this spot. The same sort of recovery function goes for manuscript texts, which we manage to decipher using context (doctors' prescription notes, with handwriting completely illegible for anyone save a pharmacist, are an

infamous example). But here again, the differences are that you can easily isolate with your eyes a single letter in space and that writing is a visual object that you can take the time to look at. As for sound, you would have to go through an editing process—that is, through a technical operation. Once again, we are ensnared in time.

But the important thing is that the operation of linguistic "selection" leaves aside a remainder: the voice. In traditional musical thought this remainder, which cannot be notated, is timbre. In both of these cases, there is a tendency to make of the voice or of timbre an object that is replete and that fills a void—an "object a" in the Lacanian sense, that which reifies difference. In a truly engaging article, the psychoanalyst Mladen Dolar presents the myth of the voice as "a sort of counterweight to differentiality, since the differential logic always refers to absence, while the voice seems to embody the presence, a firm background for differential traits, a positive basis for their inherent negativity."[8] He adds: "The reduction of the voice that phonology has attempted—phonology as the paradigmatic showcase of structural analysis—has nevertheless left a remainder," and further that it is "only the reduction of the voice—in all its positivity, lock, stock, and barrel—that produces the voice as object."[9] With his suggestion of seven morphological criteria, Schaeffer had begun to break apart this object, along with its illusory perfected plenitude.

Hearing a Voice within the Sounds

In a television program entitled *Écoute*, we hear the composer John Cage speak these revelatory words:

> When I hear what we call music, it seems to me that someone is talking, and talking about his feelings or about his ideas . . . of relationships. But when I hear traffic, the sound of traffic here on Sixth Avenue, for instance, I don't have the feeling that anyone is talking. I have the feeling that sound is acting, and I love the activity of sound. What it does is it gets louder and quieter, and it gets higher and lower, and it gets longer and shorter. It does all those things, which . . . I'm completely satisfied with that. I don't need sound to talk to me.[10]

In the same program, Cage also says that what he prefers is the sound of silence and that silence, for him, today, is the sound of traffic, which is always different, whereas the music of Mozart and Beethoven, he claims, is always

the same. Cage thus wants nothing to do with the "chorus" of the rain, the "whisper" of the brook, the "moan" of the wind, the "immense breath of the sea," or any other metaphorization, any metonymic or symbolic apprehension. He wants nothing to do with sound considered as a placeholder: the representative of something other than itself.

Cage's comments only have such a resonance for us because they touch on something profound: if he does not want to hear sounds *talking*—to such an extent that he places at the center of his discourse and his artistic procedures silence defined as sound that doesn't speak—it is clear that here, for him, there is something that we ought to flee and reject. Sounds, in fact, ask only to speak, or rather, we ask only to project onto them speech, articulation, and intention. Why would the sound of traffic escape these crosshairs? Perhaps because it is a sound that statistically speaking cancels itself out. The sound of a single car passing by tells a story. It is thus discursive—something that partakes of language. Yet the sounds of many cars cloak one other, like a doodle that continuously erases itself, just like what happens in a crowded café with the hubbub of mingled conversations. If you stand at the edge of a midsize city street when there is a lot of traffic, you will not find yourself confronting a uniform noise but will hear, constantly overlapping one another, a crowd of particular sounds that a thousand things serve to distinguish: the kind of vehicle, its model, the condition of its engine and its muffler; the changing distances between vehicles and their various speeds, which constantly modify the sound; details that stem from the manner of driving, putting on the brakes, accelerating, sputtering engines, clutches, and all tied to the possible proximity of a stop sign or traffic lights; and so forth. In short, a sum of very individualized sounds. The need to stop at red lights does not add much to the regulation of this sound, because when some cars stop, there are usually others that go in turn.

While the following analogies are often made, the sound in question is not comparable to a "flow," "flux," or "stream" unless heard from afar—like a rumor—from the other side of a river or from a high window. Listening from closer up, it is like a series of events that simultaneously cancel one other out while also, in their diversity, never melting into a collective mass. Each noise effaces the other by simultaneously not being very different and yet never being an exact replication. It is probably not an accident that the uniform sound of traffic and of passing cars takes on such importance in the final films of Robert Bresson (*Le diable probablement* [*The Devil, Probably*] and *L'argent* [*Money*]), when we consider that the director is truly phobic about

voices that "resonate in space" and that by a peculiar directing technique he gets his actors, during postsynchronization, to speak in such a manner that the sound of their voices seems to immediately absorb back into itself. With Bresson, characters are forced to re-create the silence that they have attacked through the voice.[11] We don't in fact hear ourselves speak only interiorly, but also through the reflections of the sound of our own voices, returned to us through space. The proof of this is that if we happen to speak in a place entirely without echoes, we feel wretched, as if laid bare.

It is not only in ancient myths, which evoke voices in the quivering of tree leaves or in the burble of the brook, but also among poets that we find this apparent anthropomorphism of sound against which not only Cage reacted, but also a contingent of modern art. As we find in the celebrated poem by Paul Verlaine:

> The long sobs
> Of the violins
> Of autumn . . .
>
> [Les sanglots longs
> Des violons
> De l'automne . . .][12]

Elsewhere Verlaine writes:

> The profound wind
> Cries, we would like to believe.
>
> [Le vent profond
> Pleure, on veut croire.][13]

These examples do not amount to saying, naively, that the wind is someone who cries. In the first extract, the analogy goes through a musical mediation: the violins cry like a voice, and the wind cries like violins crying like a voice. In the second, the "we would like to believe" adds an element of indecision, and it takes note of the conscious and voluntary act of projecting of the listening subject. But we would be wrong to see only anthropomorphism in that hylozoism—the notion that everything is living—which is a familiar aspect of Western poetry and which Victor Hugo took to extremes in his religious and philosophical doctrines. The epoch or mental disposition that lends to the elements voices, feelings, and complaints does not entail, from the perspective of that epoch or that disposition, referring everything back

to the human, but, on the contrary, that the privilege of the voice is taken away from the human.

Sometimes sound and voice make one, and it is not an accident that the Greek word *phonē*, from which are derived all the nouns relating to sound recording, means "voice." Sometimes they are distinguished, although never by establishing a clear border between them. In the beginning would have been the voice—that voice of Yahweh which, in the Bible, said, "Let there be light." Later in the book of Genesis a Hebrew word appears that different versions translate at times as "voice" and at others as "sound of footsteps." Characteristically it is once Adam and Eve have eaten the fruit from the Tree of Knowledge and have erred that they hear the first acousmatic sound in history and that this sound is, apparently, ambiguous. What is at stake is the "sound" of God walking in "the cool of the day" in the Garden of Eden—a sound that leads our first ancestors to realize their nakedness and to hide. On the other hand, Lucretius, in his philosophical poem *De rerum natura*, distinguishes at several points between *sonitus* and *vox*, making the voice a particular category: "For we must confess that voice and sound also are bodily, since they strike upon the sense."[14] To speak is to lose some substance, and this is shown by the fact that we find ourselves drained of strength after a "conversation which is drawn out uninterrupted" from dawn until night: "There the voice must be bodily, since by much speaking a man loses a part of his body."[15] All the same, with this poet there is an odd assimilation of voice and "musical sound," when Lucretius gives as examples of the harsh voice and the gentle voice the bellowing of the trumpet and the mythical funereal swan song, respectively. So it is that every sound to which one listens for a long time becomes a voice. Sounds speak.

In Alfred Döblin's *Gespräche mit Kalypso* [Conversations with Calypso], the titular nymph says: "When, weary, I dream and my hands play with stones as if they were little animals, and they clink and clamor, I feel an ineffable need to ask: 'What do you want, my little folk?' "[16] This sonic animism perhaps derives from the fact that the baby's lallation—its vocalization—takes hold of each and every sound, interiorizing them, conjoining them to the perpetual inner voice. Hearing oneself speak [*s'entendre parler*] is accompanied by making noise [*bruiter*] and thus by an imitative hearing oneself make noise [*s'entendre bruiter*], whereby the infant internalizes and reconstitutes sounds. At this point there would be no absolute difference or clear demarcation between hearing and hearing oneself. Sound would start to resemble the vocalization that we make out of it. Wouldn't the infant who we

were and who imitates sounds be inclined to hear in advance, in every sound that takes shape at his ears, the imitation and vocalization that he mentally shapes from it?

Word and Sound, Onomatopoeia

With language, born of the "killing of the thing,"[17] serving to elude and to sublimate absence, sound and often the word become that "empty vase" or "vibratory disappearance" of which Mallarmé often speaks, notably in his preface to René Ghil's *Traité du verbe* [Treatise on language]: "I say: a flower! and, beyond the forgetfulness where my voice consigns not a single contour, as something other than calyxes known, musically arises, idea itself and sweet, the one absent from every bouquet."[18] The rich rhymes of which the poet was fond, especially in his occasional verses and that, coming very close to plays on words, are spread over two syllables (*théière* [teapot] rhymed with *métayère* [sharecropper's wife] or *se régale* [feast] with *saveur égale* [even flavor]), underline the hollow side of the sonic signifier, the empty and nourishing pleasure of repeating a sonority in an echo, and thus eluding absence. . . .

The relationships between sound and voice also raise the question of onomatopoeia and of the way in which everyone is conditioned by the language that he or she learns and its specific repertoire of imitative words to hear in a particular fashion the same, more or less international sounds. Some could be said to be universal: the dog's bark, cat's meow, some organic or natural sounds such as rain on gravel or pebbles—even if rain does not fall everywhere with the same force and on the same type of ground or material—and, of course, the sounds linked to certain modern devices and vehicles that are sold worldwide, not to mention globally distributed programming such as American TV series. On the other hand, listening to these universal sounds is cultural. This is not only because of the culture properly speaking of each country, which treats—or does not treat—by way of poetry, musical imitation, and so forth, certain sensations as either important or not. It is also because of onomatopoeias that denote certain sounds and that make them heard differently than others.

Each language thus has its own onomatopoeic words, and the latter contribute to the structuring of our listening to even nonverbal sounds. French, for instance, nicely expresses the distinction between high and low pitches by using closed vowels and open vowels. Consider the difference between *clic* (chinking sound) and *clac* (knocking sound), *tic* and *tac* ["tick" and "tock"],

or *plic* and *ploc* ["drip" and "drop"]. French nasals express well resonance and its various qualities, lower or higher pitches: "ding" for a clear ringing or the lower pitched "dong," as in the ballad of the duel in Edmond Rostand's *Cyrano de Bergerac*.[19] On the other hand, the dearth of diphthongs in French makes it much less suited than English to express continuous and subtle variations: the onomatopoeia *miaou* that imitates the cat sound in French is more squared off, more stylized, and less gradual than the Anglophone "meow" or "miaow." Moreover, the monosyllabic tendency of English means that there are many more words that are close to onomatopoeia—the break between onomatopoeia and word is not as radical as in French—and many are the verbs like "splash," "crack," "hiss," "fizz," and so forth that have a directly onomatopoeic quality, not to mention usage. The French *bourdonnement* is longer and more abstract than "buzz," and the same holds for *craquement* compared to "crunch."

The phenomenon of onomatopoeia has led some—the most notable being Charles Nodier, author of a *Dictionary of Onomatopoeias*—to what is known as *Cratylism*, after Plato's dialogue *Cratylus*, in which the matter is debated.[20] What is at stake is the tenacious theory that would have us see in words a sonic imitation connected via a straight line to the concept or to the thing. I say that the theory is tenacious because it valiantly resists the teachings of linguistics—that is, Saussure's postulate concerning the arbitrariness of the linguistic sign—and all the invalidating evidence provided by the numerous exceptions to it. Almost all poets and many writers have Cratylist sensibilities. This goes for Nodier, as well as Paul Claudel, James Joyce, Michel Leiris, the Italian Futurist poets, and, of course, very often Mallarmé, who for example lucidly writes of his chagrin that language is not Cratylist: "My sense regrets that discourse fails to express objects by keys corresponding in coloration or bearing [*allure*], which would exist in the instrument of the voice, among languages and sometimes in one. Next to *shadow*, opaque, *tenebrousness* hardly darkens; what a disappointment to be faced with the perversity of conferring on both day and night, contradictorily, obscure timbres in the first case and clear ones in the latter."[21] We also read with interest Mallarmé's stunning student handbook *Les mots anglais* [*English Words*], in which our professor-cum-poet gives himself up with fewer qualms to Cratylist reveries and ties all words beginning with "d" or with "t" to families of meaning and association created by the tones of these consonants.[22]

In one of the chapters of his *Mimologies: Voyage en Cratylie*, Gérard Genette lists numerous variations on this tradition.[23] He reminds us that

Cratylism often works on two levels: the written and the oral. The letter is seen as a visual imitation of that which the word describes, the sound as a sonic imitation, and the two levels are linked by the principle of (incorrectly?) so-called *phonetic* writing. Even today, the dream of a universality of imitative significations is not always abandoned, and the interesting research of Ivan Fónagy in his *L'esprit des voix* [Spirit of voices] (1983), which is dedicated to the matter of "psycho-phonetics," demonstrates the persistence of this idea. The author tries, for instance, to isolate universal invariants: the apical trilled "r" would be everywhere virile; "l" everywhere feminine.[24] This is an age-old example, since we already find it precisely in the *Cratylus*, when Socrates—or rather, Plato's version of Socrates—after getting his interlocutor to agree that "r" bears some resemblance to movement, roughness, and change in place, and that "l" is on the side of the "polished" and "gentle" (confirming the ancientness of the archetypes unearthed by Fónagy), maliciously puts before us the case of *sklēros*, which means "harsh" in spite of the presence of that much-touted "l." In its acceptance of the contradiction and its evasiveness, Socrates's conclusion is very Schaefferian. Certainly, he says, "I too would love it if nouns resembled objects [. . .] but I fear that we must have recourse [. . .] to that coarse expedient of explanation by convention."[25] In other words, it is often usage that is decisive. On might also consult Jakobson, who in his *Six Lectures* reminds us that the l/r consonant opposition does not exist in Korean (or in Japanese for that matter).[26] What happens, then, to the universality of male/female opposition? Like many matters that touch on sound, we find ourselves in an in-between space, oscillating. But rather than making do with a lazy relativism, let's try to figure out how exactly this oscillation works and what it indicates.

5))) Noise and Music

A LEGITIMATE DISTINCTION?

Is Music a Sound Apart?

In a letter to Goldbach dated April 17, 1712, Leibniz wrote: "Musica est exercitium arithmeticae occultum nescientis se numerare animi."[1] We must return to this tenacious notion that the musical ear hears mathematically. In school and in musical theory handbooks we learn—and it is true—that A above middle C in the current, official tuning has a frequency of 440 Hz, whereas an A an octave higher has a frequency twice that, at 880 Hz. Likewise, the interval heard as a perfect fifth, to use the Western terminology, has a mathematical ratio with regard to frequency of two to three. More concretely, a string divided in half vibrates an octave higher—and the sound from one octave to the next is, as far as our ear is concerned, the "same" sound, all the while situated in another register (without thinking about it, we all sing in our own register and transpose to the octave that suits our voice if we want to be in unison). It is this "miraculous" encounter between the ear's qualitative perception of intervals according to a logarithmic law and the physics of strings and pipe lengths where frequencies follow simple mathematical ratios that has often positioned music—to borrow Jacques Atlan's apt expression in his essay "Philosophie de la musique [Philosophy of music]"—at the center of "the age-old philosophical question of the relationship between the sensible and intelligible worlds."[2] As the famous formula cited above in the original Latin has it: "Music is the hidden exercise of an arithmetic in which the spirit does not know that it is counting."

The words that stand out in this well-known dictum are "hidden" and "does not know." Does music cease to be such an exercise if the spirit knows

and if this arithmetic is no longer unconscious? In fact, we do not perceive numbers but rather the "effect" of numbers. Nor do we perceive the differences in length of strings and vibrating pipes but rather the "effect" (still qualified with quotation marks) of these differences. There is certainly a transposition of quantitative relationships into qualitative relationships, but in this transposition the mathematical and arithmetical relationships are not entirely preserved. We perceive intervals between which there is an ordered relationship in the mathematical sense (D is between C and E), intervals measured in calibrated units (semitones and whole tones, standardized by the equal-tempered scale), but not absolute relationships: no one hears an octave, which equals an intervening space of six whole tones, as the double of a tritone (an interval of three whole tones, as, e.g., between C and F-sharp), nor a major third (two whole tones) as the double of a whole tone; they are simply heard as larger intervals. Moreover, this holds for only a portion of the sonic domain—namely, tonic sounds, of which more below. This is a significant portion, but a minor one in numeric terms. It does not hold for complex sounds. Whereas the art of painting—representational or not—treats all forms as acceptable and is not thought of as a combinatory of simple forms, should we treat music, or the art of sounds, like a construction set in which only spheres and cubes are allowed?[3]

Most traditional musical systems in fact privilege sounds with a precise pitch that can be made out by the ear and abstracted from the sound. In his *Traité des objets musicaux* [Treatise on musical objects], Pierre Schaeffer calls these "tonic sounds." I attribute this predilection not to the fact that these sounds are more pleasant, as is claimed, but because they have the property of standing out. Because of the functioning of the ear rather than because of some simple physical specificity, these sounds seem to have the ability to stand out from all other sounds, which Schaeffer calls "complex" and which, while they may have precise sensory qualities and be sharply delineated, do not have a precise pitch. Moreover, the latter are on this account by and large excluded, marginalized, and filed under the rubric "noise" for the majority of traditional musical systems, and not just the Western system. From the acoustical perspective, at the level of elements—that is, at the level of isolated notes—there is of course no such clear break between the three domains that are conventionally called "speech," "music," and "noise." If a so-called musical sound is merely a "sound with precise pitch," which is what textbooks still say, then a note sounded by a toad, a streetcar signal, or the electric purring of a neon light ought to be perceived

as a musical sound, and this is far from being the case. On the other hand, the sounds of percussion and of very shrill or of very deep notes for instruments in musical scores should be heard as nonmusical, which is not the case either.

Certainly, traditional music for the most part makes use of tonic sounds, but it is the way in which these are linked and also by the identification of sources officially deemed "musical" that it is recognized as music. The proof of this is that with the technology available today one can easily produce a melody out of a dog's barking—since certain barks have a very clear "tonic" aspect—transposed to various scale degrees without this melody being heard as musical. The listener will either smile or will become indignant and, even though we are talking about a melody that has all the "official" characteristics that bespeak music in the most conservative sense (regular rhythm, recognizable tune, etc.), will rank this example among provocations or gags, since the dog is not a recognized instrumental source. The assessment of noise as noise and of music as music is thus a matter of cultural and individual context. It does not inhere in the nature of the elements but for the most part is attributable to the imprimatur "officially musical" on the source, as well as the perception of a particular order or disorder among the sounds. These two criteria are perfectly independent of one another, although it appears that common taste conflates them.

As we have seen and will see again, there is doubtless a sonic continuum in which, at the level of elements, speech, noise, and music exist in the same world. On the contrary, it is our ways of listening that are discontinuous, weaving among quite different modes (causal, code-oriented, reduced, linguistic, aesthetic listening, and so forth). The conventional tripartition into speech, noises, and music is ratified and upheld by television and film not only with regard to conceptualization and technical production but also with regard to subsequent analysis, as all the research that privileges dialogue, voice-overs, and "film music" amply demonstrates. And it goes without saying that when a film is mixed, music, noises, and speech are put onto different tracks. For all that, are these distinctions relevant to cinematic analysis? And should we perhaps substitute for them a classification and comparison of sounds based on form itself (punctual, sustained, discontinuous, tonic or complex, pulsed or not, etc.) and on the material proper (grain, materializing sound indices, speed, etc.)? I would say that we need both. That is, we need to recognize the tripartition as such and consider each element in relation to its specific level of organization (instead of acting as

if dialogue is not listened to linguistically and music listened to melodically and rhythmically), but, at the same time, we need to hear and to recognize in all the elements the same "sonicness." In particular, we need to know how to hear that a shock, a sonic point—be it a pizzicato note on a violin, a slamming door, or short exclamation—fulfills a specific function within a global temporal organization. Or again that, in a film, independently of aesthetic categories, pale or tremulous timbres in the musical score make the latter communicate using "noises" pertinent to the narrative level.

What Is Noise?

If you ask a speaker of French what is *bruit*—which translates more or less into the English "noise"—the only answer, as for *son*, or roughly "sound," is that it is a French word. In the French language, this word designates a series of notions that do not necessarily have precise relationships with one another and, furthermore, these different definitions are not standardized. In this regard, every language has its particularities. For example, in French *son* is rarely used in daily life to indicate a nonmusical or nonvocal sound. In such cases, the term to which we recur is *bruit*, which is irremediably branded for the Francophone with its pejorative meaning. The French speaker will more often say "*bruit de pas* [noise of footsteps]" than "*son de pas* [sound of footsteps]," whereas in contemporary English "sound" applies just as much to footsteps as it does to music (characteristically, noises in film are called "sound effects" in English). In French *faire du bruit*, that is, "to make noise," is a synonym for disturbing or attacking. *Ne faites pas de bruit*, that is, "Don't make noise," is what we say to French children, whereas English tends to employ the more positive "Be quiet." In English, the word "noise" is reserved for whatever might be parasitical or background noise (what must be eliminated in the technical reproduction of a sound) and limited to the acoustic sense of the word *bruit* in French. As for *bruit* in the sense of a disturbance, it can apply to the sweetest piece of music by Mozart if we are forced to hear it in an inappropriate context or against our wishes.

A standard definition of the word *bruit* in French and one that is precisely put in a much-used dictionary has it as a sound that "is not felt to be musical."[4] While this definition is cautious—that is, it aims to be psychological and relativist—it curiously forgets the matter of speech, as if the latter were already no longer part of sound. However, spoken language is made up of sounds in which "various nonharmonic vibrations" (nontonic sounds)

play an important role.[5] No one says that what we have here is noise, unless speech is unintelligible or muddled. This lack of coherence in the standard definition, which will also be found in scientific works, is odd. Everything takes place as if phenomena of structure and organization were not at stake and that the crucial thing were to stick to and objectify *at the level of the elements themselves* the distinction speech/music/noise by assuming that every component of a piece of music should necessarily be a musical sound, that every component of a spoken discourse should be a verbal phoneme, and so forth. Acoustically, this makes no sense.

In the French context, the word *bruit* has served as scaffolding for a great many false theories because it is open to the myriad semantic ambiguities. I am thinking, for example, of Jacques Attali's *Bruits* [translated as *Noise*], which came out in 1977 and had its moment in the sun, and that waves about almost every possible meaning of the word without even once asking about the unity of its topic.[6] In French, *bruit* is in fact all at once:

1. A sonic phenomenon characterized by a nonperiodic frequency structure ("complex" in Schaeffer's sense).
2. The useless part of a sound signal with respect to the expression "signal-to-noise ratio," as well as in information theory.
3. That which is neither speech nor music identified as such. This is the *taxonomical* usage, which I have used within the context of my work on sound in film.
4. A sound considered in a negative light, as disturbance or nuisance. This is the psychological and affective usage.

The regnant lack of distinction with regard to sound between the physical and perceptual levels in language today means that noises are often described in commentaries and dictionaries as perceptually "confused" on the pretext that acoustically they do not have a simple spectrum. However, there is nothing less confused than a hammer blow, which fits three of the four definitions of noise given above. Rather, the usual musical criteria and acoustic theories are simply unsuited to describe it. In terms of the Schaefferian typology, for example, the sound of a hammer blow can be described as a "complex impulse" and designated with the symbol X′.[7] We could also describe it in terms of "site" and "caliber," as well as in terms of stiffness of attack. In short, we could describe it, at least in part, without being forced to have recourse to the symbols of traditional notation, which are inefficient in the case in question.

That a complex sound according to Schaeffer's definition should be difficult to ascertain in terms of pitch does not mean that it is muddled. It simply means that the criterion of pitch is not the right one to delineate it. What we have here is a typical example of all-or-nothing thinking in which the very great—too great?—precision of the ear with respect to certain sounds—that is, tonic sounds—regarding their pitch is still cause for pondering today. Certainly Claude Bailblé is correct when he speaks of the great number of "weak," apparently confused, forms of naturally occurring noises in our sound world. But it must be added that this goes for the visual world as well, and yet, in the current state of discourse, we more easily reduce them: the chaotic and haphazard form that the crest of a mountain range puts before our eyes can be analyzed as a series of angular forms, as serrations, as round forms, more or less flattened, and so forth. When it is a matter of abstract objects, the richness of our descriptive references renders the visual world legible to our eyes. The visual world no more than the sonic world is given to us as structured from the outset. Rather, this structuration is a product of education, language, and culture. For the visual, it is learned little by little, notably via language and drawing. For sound, on the other hand, it remains rudimentary, and this holds wherever you go. The Schaefferian criteria provide the means—as I have seen from experience—to begin to perceive units, points, and lines within the apparently undifferentiated continuum of the audible universe. Needless to say, it is not a matter of little landmarks placed here and there, and we cannot reduce everything that is presented to our ears to these basic forms. But in order for the apparent sonic "flux" to little by little change in appearance, it suffices that it be punctuated, carved up, partially structured by the forms that we peel away from it and by the sound maps and more or less shifting types that we learn to delineate within it.

In order to change this situation, we must be satisfied with accepting that such progress in perception is not linear and that a goodly part of sounds continues to elude our ambition to classify them—in short, we must resign ourselves to the fact that from the lack of differentiation with which we began we cannot instantly gain access to a nice partitioning of audible reality. In effect, we cannot think that someone, armed with a few descriptive tools furnished by a book such as this one, engaged in the observation of all manner of sounds, including nonmusical ones in the classic sense, will find herself besotted with a newfound mastery over that which previously seemed shapeless. After all, she wasn't previously concerned with this shapelessness. And now that she is, she gets impatient at not being able to reduce

it as easily as she might carve up a traditional musical composition (as long as some technical training has been had) along the lines of harmonic, rhythmic, and melodic components. There is something illusory about the latter too: a classic musical piece is for starters made up of notes—the notes that we see on the score—but it no more takes the shape of notes than a house takes the shape of tiles and bricks. It is made also made of volutes, smoke, bells, rumblings, chimes, stridulations, gurglings, chirpings, and so forth—and here it is not a matter of figures [*images*] but of models of form. Let me take up once more the inevitable parallel with the visual: clouds in the sky, even if they correspond to nongeometrical forms, appear to us anything but confused because we know how to reduce their complexity to a few simple forms. Moreover, a cloudy configuration leaves us the time to observe before it changes appearance, whereas observing sounds is like observing clouds that very rapidly stream past and transform. It is here that we must develop an observational practice for forms in motion.

A noise is thus "confused" in the same way a language seems confused to someone who has not yet learned to decipher it, that is, to structure it.

Curiously, the imitation of noises is a sensitive question in the history of Western music, as if in so doing the latter ran the risk of returning to matter—to the muck from which it came. Wind is, however, one of the noises that many older musical traditions tried to evoke. We find imitations thereof in Bach as well as Debussy ("What the West Wind Saw" in his *Préludes* for piano) and in Vietnamese music. But Olivier Messiaen in *Des canyons aux étoiles* or Maurice Ravel in the complete score for the ballet *Daphnis et Chloé* use in punctual fashion a theatrical sound-making instrument: the aeoliphone, or wind machine, which makes a fairly good evocation of the wind, albeit stylized, by rubbing a piece of rolled up fabric across wooden rods. This direct imitation has sometimes been criticized as a vulgar sound effect. In effect, people are quite ready to allow noises to be imitated, but they want the imitation to be sublimated. The illusion that the original and the reproduction are the same is unacceptable; rather, there must be an aesthetic leap such that the latter evokes the former without for all that resembling it.

Berlioz's *Symphonie fantastique* is full of grunts, growls, and screams (particularly in the "Dream of a Witches' Sabbath" movement), but these translate the impressions of someone who is on drugs and thus they have a pretext or frame. Already in Vivaldi's *The Four Seasons*, we come across the evocation of a dog's barking, although few people know this. If you read the score, which includes realistic notations, we read, in the second movement

of "Spring," above an enigmatic motif consisting of two notes that obstinately repeat in the bass: "*Il cane che grida*," that is, "The barking dog." It is further specified: "This must always be played very loudly." Of course, no one gets the impression of really hearing a dog's barking, and it was by no means the composer's intention to create the illusion of such. What we have is a sublimated and transposed imitation. We thus land back on the matter of sublimation: the notion that music raises sound to an entirely different plane.

Dialectic of Noise and Music

There is common ground shared by the domain of music and that of speech when the two appear opposed to the world of noises: in both cases, the succession of sounds is perceived as beholden to a certain overarching structure, to an organization that retains the "value" of each sound, whereas that which does not make an immanent logic emerge is heard as a succession of noises. The whole business is then knowing if a sound, in order for it to lend itself to musical organization, must have a particular intrinsic profile, which was not only the notion that "serial" composers held but also Schaeffer, with his *suitable* objects (i.e., suitable for music). Of course, we have already considered this notion insofar as it relates to language. Based on certain linguistic findings, we know in fact that any type of sound is good for language production because language stems from a system of differential oppositions.

Particularly on the aesthetic plane, the play of values is in a sense just as much a giving of the star billing to that which doesn't constitute these values as it is the development of a differential discourse. Put another way: the musical is that which permits one to savor the sonic, which is not included as such, with utter peace of mind and clarity of perception. The source of musical pleasure—and this is especially true for bel canto and instrumental beauty—is only partially in the score. Vocal sounds that would not be sung if proposed separately take on at this point a different meaning. Take the most typical case in Western music: that of so-called classical or acoustic guitar. To listen to a recording of a piece by Fernando Sor or Heitor Villa-Lobos is to hear well enough—and in fact to hear very clearly if you are a musician—pitches, harmonies, and rhythms, all the while perceiving in a diffuse manner all sorts of little noises some of which do not have anything musical about them in the classical meaning of the term and do not even belong to that which gets officially labeled the guitar's timbre: squeaky glides that are produced by the movement of the fingers over the strings along the neck of the

guitar, percussive sounds, and so forth. These phenomena are not systematically organized, nor are they marked out on the score, which is limited to melodies, chords, rhythm, and attack. The perception of the whole is not for all that muddled, because these sonic details are attached to a "musical" strand: noise is hitched onto the thread of the notes, and the musical is nothing other than this thread. But if we were to suppress these "little noises," the music would lose its flavor, as we sense when we hear electronic imitations of the guitar, produced by a synthesizer, for instance. Anyone who thinks that listening to a piece of music means only listening to the musical is mistaken if what is thereby understood is that everything heard is subject to musical law. What one in fact hears is the sonic overlaid with a musical grid.[8]

It seems to me that all musical systems—this is at least my supposition, since I am familiar above all with the Western musical system and have rudimentary knowledge of some others—necessarily entail what borders them and is apparently foreign to them. In other words, each entails the assimilation of punctual effects that elude the system in question (that is to say, its scales, its rhythmic values, its modes of intonation and of timbre) with the aim of representing the real, noise as such. In Western music, "noise" effects appear very early on. These, of course, have imitation as their purpose, although not necessarily the imitation of sound, but rather for the rendering of movement, light, and so forth. At the same time, the musical brings noise into the foreground as an event, as a moment of the real, while noise for its part, like a beauty spot, magnifies the musical. Every musical system is in fact a system for creating "sonicness," and the latter in turn valorizes musicalness.

The role of noise does not start, as is often thought, with contemporary music. It is already important in the seventeenth century and pertains not only to imitative musical effects. The repeated notes and trills in Scarlatti's harpsichord sonatas are notated such that creakings and cracklings might be heard. The bass tones on the pedalboard in Johann Sebastian Bach's works for the organ arouse mutterings and rumblings that are heard as such yet justified and as if "excused" by the musical context and the instrumental source. In Mozart's time, the tremolo is not only a dramatic and coloristic effect but also a grain. The opening of the celebrated—and sublime—Piano Concerto no. 20 in D minor (K. 466) is all muttering and breathing and makes particular use of a rapid ascent in the bass notes, swift strokes, and quivering syncopations. It bathes in a sort of semimusical fog that only a bit later clears up into more lucid tones and notes. And that is nothing compared with orchestral music from the end of the nineteenth century.

What hides this role of noise from the ear—and from the eye and mind—of classical musicologists, as I have said, is the fact that on the score those effects intended to produce it are marked using the same symbols as the "notes." But when a composer writes for the extremely low register of the double basses or the very high-pitched register of the violins or piccolos, has scales played at high speeds, or piles up notes in a narrow corridor of pitches, which creates complex masses, he adds his "share of noise" to the classical music recipe (notes, periodic cycles). Certain effects are created by special playing techniques (tremolos, vibrato, flutter-tonguing) or indeed by particular instruments (percussion), as well as by specific combinations of timbres. Others still are produced by the simplest means: using a given instrument's extreme notes—high-pitched notes for high-pitched instruments and low-pitched ones for instruments with a low register—where the ear ceases to clearly distinguish degrees of pitch, just as the human eye, below a given threshold of luminosity, sees colors less distinctly. In short, traditional music makes use of *perceptual gradations* that make it so that at the high and low border areas of the register, sound, in the sense of notes, shades off into noise, in the sense of lacking precise pitch. Yet at the same time, it remains centered on muscular, time-tested musical values.

Many Western music buffs and even musicologists are, on the contrary, convinced that the Western musical tradition would deem itself purified of noise and that this tendency comports its specificity. In Europe, we see ethnomusicologists, as they are known, crediting "non-European musics" (a category that, like noise, is created by the process of elimination) with not having suppressed their share of noise, contrary to the West, and of not hesitating to enrich sound with noisy elements. If this is true for certain instruments (such as the African mbira, or thumb piano, where metal bottle caps or similar objects add their buzz to the vibration of the tuned blades), we have reason to be skeptical about the general worth of such a characterization. It could well be that the "noisiness" of so-called non-Western musics, which once was held against them in the West and now on the contrary is treated as a sign of vitality and naturalness, stems instead from an effect of perspective created by a certain culture of listening related to the fact that their instruments are less familiar to us. There is also a significant share of noise in a transversal flute (the clacking of the keys), a violin (scraping), and of course "acoustic" or classical guitar, but the Western listener gets used to not hearing these noises and "scotomizes" them in his or her mind—if the recording itself doesn't try to rub out the sounds of breathing or of instru-

mental mechanics. On the other hand, recordings of so-called traditional musics are often made by and for people who find something charming about such noises, and such documentations strive to preserve them and even to emphasize them in the recording process.

Since in this work I am limiting myself to the essential, I cannot in a detailed fashion demonstrate how music in the middle the twentieth century decided to act with angelic virtue by reducing sound to pure physical data. And yet I must show how it thereby acted brutishly, that is, how in its desire to seek abstraction in a purely conceptual and parametrical dimension while simultaneously increasing its complexity, it weakened the divide separating it from noise.[9] In effect, noise incarnates in the discontinuous—discrete, as we say in the terms of linguistics—universe of the Western musical system the role, simultaneously slippery and seductive, of the *continuous*. And thanks to a very telling vicious circle, the more one tried to subdivide and render discrete musical matter—multiplying fine distinctions, shrinking intervals, and so on—and thus the more one hoped to extend musicality to domains that had hitherto been relegated to "color" and to the empirical, the more one increased the feeling of continuity and, in a sense, of noise.

During the nineteenth century, we witness a fairly complex evolution in Western music in which the trend is to multiply sonic effects, to enrich and thicken chords, to increasingly play on what gets called the chromatic totality (in concrete terms, the twelve black and white keys on a piano between a given note and either an octave up or down), and thus to construct a sort of vital and quasi-continuous musical substance in which timbre, pitch, and harmonies seem—in any case for the listener—less and less dissociable, more and more fused. Especially by its adversaries or at least by those that it troubles, this evolution is often experienced not as progress and sophistication but rather as a return to the primitive and to noise. As if there were here a circle from which no one could escape because, by multiplying nuances, subtleties, and complexity and by refining the intermediary degrees between notes, we fall back into the continuum from which Western music sought to free itself.

In his satirical futurology *Paris au XXe siècle* [Paris in the twentieth century], Jules Verne targets the music of Wagner, characterizes its sound as "drab, stringy, indeterminate," and above all sees in it complicated noise.[10] Later, Gide will worry in less peremptory terms: "Sound itself, so gradually and exquisitely liberated from noise, is returning to it."[11] What these writers consider tantamount to noise is that moving and melting musical substance

that for them no longer makes distinct and clear sonic forms stand out. Mirroring this, Wagner celebrates and puts to work this evolution as, on the contrary, the conquest of music as a whole by "infinite melody." Is this the reabsorption of noise by music or of music by noise—noise here in the sense of undifferentiated gangue, of unrefined mineral, from which would be shaped the musical note?[12] That is the question. The sentiment of Verne, Gide, and many others can be explained in part by the fact that the sonic matter of traditional music is much more clearly distinguished from non-musical sound, the sound of reality, than the matter of pictorial art—forms, materials, colors—is distinguished from the visible world.

Let me add that traditional music perhaps has much more need of this. The note—the inscription of the sonic into a musical corset—is sometimes in fact the only way for a sound to be framed in relation to others. If the makeup of a painting resembles that of a plant in the artist's studio or in the house of the painting's owner, this resemblance does not present any disadvantages because the frame encloses its forms and allows them to be distinguished from reality. This does not hold for sounds, since there is *no sonic frame* for them. As a result, the fact that a musical sound is beholden to a specific form that distinguish it from sounds in the ordinary world, that it is put into an organization with others of its type according to a very exacting law, and that, perhaps above all, it issues from a source listed as an instrument set aside for the production of musical sounds, would be the equivalent of framing, such that we can recognize it as belonging to the work and not to reality, since, on the spatial plane, it mingles with the sounds of life. As a composer of musique concrète, I am in a good position to grasp the problem: I often happen to use in my own work, at precise moments in the composition, sounds about which the listener might wonder whether they belong to reality or if they are coming from the loudspeaker. Examples might be a dog barking in the distance or a human whisper. In a film, the spectator cannot have any doubts of this nature, since the distant dog that he sees on the screen definitely belongs to the film, being inscribed within its frame.

Furthermore, visually, the physical world happily puts before our eyes, not only with respect to human creations but with respect to natural ones too, vivid colors and robust forms. These serve, moreover, as privileged models for art: a sunflower, the disk of the moon or of the setting sun, the curve of a breast, the flatness of a pebble, the horizon line of a plain, or the truncated cone of Mount Fuji. On the other hand, the so-called natural sound world is mainly made up of *weak forms*. Would everything in music that drowns out

forms into a vacillation of sorts tend to be perceived as noise? We may certainly ask this question. Why, in effect, since visual aesthetic feeling takes its coordinates from reality—the beauty of a countryside, of a tree, of a human body—couldn't sonic pleasure take its coordinates from the sonic environment? It is here that we can see there is no point of comparison to what happens with the visual. The murmuring of a stream can be a source of reverie but is not by itself qua sound an aesthetic model. Even when recorded under good conditions, it is monotonous and barely malleable.

In his *Traité des sensations* [*Treatise on Sensations*], Condillac imagines a statue endowed in successive stages with the various senses. In this text, he puts forward a question concerning simultaneous hearing: "The pleasure of a sequence of sounds being so superior to that of a continuous noise, there are grounds for conjecture that, if the statue hears at the same time a noise and a tune, where one does not dominate the other, and which the statue has learned to recognize separately, she will not confuse them."[13] As an example of a continuous "noise" that does mingle with a melody, Condillac gives that of a "noise of a stream." He thus draws an absolute distinction between sounds and noises as belonging to two radically different universes. In fact and contrary to what the author seems to believe, that a musical tune stands out from the sound of the stream—this is implied in the example given—is not at all on account of aesthetic reasons. It happens simply because of perceptual emergence, as well as being a matter of informational stakes: the sound of a stream carries no message. If the philosopher had taken as his example the juxtaposition of everyday spoken message and a musical air (a trite example today thanks to sound cinema and television, but a still rare one in the eighteenth century), the problem would have been posed differently, since the ear of the statue would then find itself divided between two signals, with one associated with aesthetics and pleasure and the other with information. The singing of words represents a reconciliation of the two, not to mention poetry as it was still declaimed in the eighteenth century, that is, with cadences and a rhythm distinct from ordinary spoken language.

Language, because of the strength and suppleness of its system of differences, does not necessarily entail robust sonic forms. Music, in the classic sense, for its part often entails sounds with strong and delineated forms. And the music that contemporary humans make by turning on the radio, by playing a record or CD, or by listening to a digital audio player constitutes a structured and differentiated noise that stands out from an ever increasingly undifferentiated and continuous thrum. Music based on sounds that do not have the

proper form in the traditional sense but other textural qualities is obviously possible and is even widely practiced. It is easy enough to do as long as other means—in particular certain formalities, the care with which it is presented to the public, in a concert hall—create the frame that affirms it as such.

In 1913, the Futurist painter Luigi Russolo published his manifesto *L'arte dei rumori* [*The Art of Noises*]. In it he calls for a new sonic art that would escape the restraints of traditional musical sounds. I will pause on the particular case that this attempt represents—it is one of numerous trends in contemporary music at the beginning of the twentieth century—because it exacerbates some of the contradictions tied to the desire to bring "noise" into the field of music. All the same, we must not forget that in 1913 the notion one could make of such a desire was not the same as today, and the technical means to carry out certain aspects of what one sought to do were not yet available. "Musical art," writes Russolo, "at first sought out and obtained purity and sweetness of sounds. Afterwards, it brought together different sounds, still preoccupying itself with caressing the ear with suave harmonies. As it grows ever more complicated today, musical art seeks out more dissonant, stranger, and harsher amalgamations for the ear. Thus, it comes ever closer to the *noise-sound*. This evolution of music parallels the growing multiplication of machines."[14]

If we follow Russolo, music starts off with a reduction and rigorous selection of sounds and evolves naturally toward more complex and shrill "amalgamations." It thus comes back naturally to noise. We also see that the Futurist cult of noise, as for certain filmmakers in the 1920s and 1930s, is accompanied by an assimilation of the latter to the dynamism of the industrial age. Above all, we see that Russolo—as well as most theorists of contemporary music—recounts the history of music at the turn of the century not as a *construction*, as the creation of new universe of sounds, but as the progressive *annexation* of an existing territory: that of noises. By adopting this historical model, we sidestep two questions: that of the production of sounds that would not "naturally" exist independently of humans; and that of the handling of causal associations linked to these new sounds.

Already with Russolo, bruitist composition stands together with bruitist listening, described as the management of an already given chaos—as an orchestra conductor taking charge and mentally directing and controlling his own audition. When the painter-poet-musician writes that "we will amuse ourselves by orchestrating together in our imagination the din of rolling shop shutters, the varied hubbub of train stations, iron works, thread mills, print-

ing presses, electrical plants, and subways," it is hard to know whether by the term "orchestrating" Russolo intends re-creating and controlling—thanks to the apparatuses called *intonarumori*, or "noisemakers," that he would construct—or rather listening musically to existing noises.[15] Actually, he appears to conflate the two: listening differently amounts to mastering; hearing is already a form of making. This history of music is thus described by Russolo and by many others as a colonization of savage territories, with its paternalist connotation and with the typical ambivalence of colonialism with regard to the domain of sound deemed natural: its primitive power is both venerated and mistrusted. Russolo thus passes from the enthusiastic description of noise in its savage intensity—noise as source of energy and as appeal to the awakening of the senses, to life—and without thereby excluding the "absolutely new noises of modern warfare," to the proposal to "tune these diverse noises, regulating them harmonically and rhythmically"—in other words, to order and regulate these phenomena.[16] This is one of the aspects of this approach that is rarely emphasized. Moreover, Russolo is in any case convinced that the majority of noises have clear tonal and rhythmic dominant centers: "Every noise has a pitch, some even a chord, which *predominates* among the whole of its irregular vibrations."[17] Noise-sounds would therefore already be structured by the dominance of simple and pregnant perceptual elements that serve to center their perception—which is not always true and represents rather a reduction of the novel to the known. The bruitist approach is thus not at all in praise of chaos.

Russolo challenges—and rightly so—the idea that there is an absolute difference between noise and musical sound, but he does so in both directions. He proposes in effect that sound (in the sense of tonic sounds) is already made up of several harmonics—with the exception of fixed standard pitches—and is therefore not pure. Yet at the same time he likens noise to a sound even more rich in harmonics than usual musical sound, that is, to a rich note. While he draws sound in the direction of noise, he simultaneously draws noise in the direction of sound. The author in several of his writings characterizes the universe of noise with reference to what he calls "enharmony," a term that he uses in a very different sense than its received meaning in classical music. According to Russolo's usage, which is inspired by the meaning of the word in ancient Greek music, enharmony applies to micro-intervals that are smaller than the tempered halftone and refers to the idea of inserting imperceptible pitch gradations between sounds rather than continuing to leap between tones. Bruitist scores are, moreover, written using rising and falling

lines that represent the progressive movement from one pitch to another with the aim of addressing—to use Schaeffer's terminology—the continuous fictile ear rather than the scalar ear. In Russolo's sense, an enharmonic noise would then be a sound composed of progressive and continuous pitch variations, in accordance with the notion that nature does not know the rigid distinction into halftones and is familiar instead with finer and more continuous pitch variations. It was in this spirit that Russolo along with Ugo Piatta constructed his first *intonarumori* (which included a gurgler, an exploder that aimed to reproduce the noise of the combustion engine, and so forth) for which he composed works that he called—in typical fashion—"noise spirals" under the titles such as "Awakening of a City" and "Meeting of Cars and Airplanes."

Russolo furthermore, as a proper contemporary of an era that moved away from figuration in painting and tended instead to the expression of movement, light, matter, and form in itself, rejected with disdain—as had nineteenth-century composers—the notion of an imitative reconstitution of noises. For him too, imitating the sound of the rain would have seemed the height of ridiculousness. It is here that the causalist misunderstanding once again comes into play. If in effect the project of imitating a noise is immediately thought of as a naive "illusionist" evocation of the source, this is because the goal of such an approach is implicitly put forward as producing the illusion of presence of the sound source—a *trompe l'oreille*, or auditory illusion. As if figurative painting had stopped at the idea of a trompe l'oeil, or optical illusion. Just like a tree's bark, the shaking of poplar leaves possesses its own texture. Attempting to imitate it, as have certain composers of musique concrète, often using various electronic sources, has nothing to do with the idea of producing the illusion of the tree by the sound. Rather, it is *heading off in search of the audible*. The approaches taken in the 1950s and 1960s are more lucid in this regard. Many composers did not hesitate to work on sounds taken from life, drawing from reality models of texture and form, not only starting from direct reproductions of recorded sounds but also using them as an inspiration to create in the studio new sonic beings transposed from natural sonic existence. The methods of transposition can be diverse—Xenakis's use of the mathematics of Gaussian curves and the law of large numbers; François-Bernard Mâche's use of phonetic analysis; Pierre Henry's and François Bayle's analysis in terms of sustainment, texture, and dynamic schemata; and the acoustic analysis of the so-called spectral composers—and the resulting works considered more or less convincing

depending on one's tastes. All said and done, an enormous step has been taken, which shows us the exit from the false dilemma that would oppose the imitation of sonic reality and aesthetic dignity.[18]

Cinema as a Place Where Sounds Cohabitate

Moving on to cinema, is the problem of natural noise in narrative films different than the one that it poses for music? In other words, can the aesthetics of noise in cinema be summed up by the matter of adequacy between the sound used and the effect sought, and is it completely subjected to a narrative and dramatic logic? In a sense, the answer to these questions is yes. Yet the effect itself does not go uninfluenced by the formal and material quality of the sound. In the films of Jacques Tati, not to mention in the "sound objects" that sound engineer Ben Burtt created for George Lucas's *Star Wars* (pneumatic doors opening and closing, the hum of light sabers, robotic beeps and blips, and the rumbling of spaceships), the sounds are exceedingly and firmly delineated, organized, equilibrated, such that each intervenes in succession, and this sonic quality contributes as much to the comic or spectacular effectiveness of the films as it does to our sensory pleasure. Of course, there are various sound aesthetics. Just like the beauty of a sound from an electric guitar is not the same as the beauty of a sound from a trumpet and appeals to different criteria, there are several types of cinematic sonic beauty. In some cases, it is the sound's form—its "aerodynamics," as it used to be called—that counts; in others, it is the quest for a material, a texture, as for a fabric.

The feeling of sonic beauty is thus linked to the perception of certain sonic criteria that are either harmoniously combined or adapted to their context. The study of the sound aesthetics of films must also rest on sensory criteria—criteria that reduced listening allows us to apprehend by going beyond the traditional musical criteria, which often do not apply. The notion that the creaking of a door, a scraping sound, an impact—whether in a piece of musique concrète or in a film—can be beautiful will cease to elicit sneers when it is understood which laws of balance, energy, force, expressivity, and power they can follow—or not—if they have knowingly been given form, profile, and substance.

As we know, both silent and sound cinemas were at first for the most part musical and sung. In the silent era there was musical accompaniment and sometimes spoken commentary and theatrical, punctuating sound effects.

Orchestral musical accompaniment dominates the very first "sound" films, such as Alan Crosland's *Don Juan* from 1926. Dialogue did not finally make its still embryonic debut—in last place in the chronological order—with *The Jazz Singer* in 1927. It was a solid last place, though, and tends to overshadow the rest.[19] The history of sound in cinema and the cohabitation of musical, spoken, and sound elements are topics that I have often treated, but here I want to approach them from a different angle: How is it that what is at first in fact a purely additive coexistence leads to the various sonic elements of film either being assimilated or dissimilated, as is said in linguistics?

Assimilation is either the dream of a continuity among words, noises, and music produced by "bridges," echoes, identities among the different domains, and cinema offers various examples of this, including those drawn from the field of "popular" cinema (musical comedy, action, and science fiction films); or it is a very tight plaiting of these elements, which find themselves inserted into a continuum or a system of extremely dense alterations that makes each give speech to the other. The latter is particularly in use in classical Hollywood cinema, in which, at a certain stage of development, music and (sparse) noises are very exactingly imbricated, whereas the dialogue, enunciated as a sort of recitative, takes place against a background of Max Steiner–style affective orchestral accompaniment: films such as *Casablanca* (dir. Michael Curtis, 1942) or *Now, Voyager* (dir. Irving Rapper, 1942), admirable paragons of Hollywood melodrama, are two prime examples.

Dissimilation, on the contrary, entails setting up a discontinuity among the elements, either with comic aims (as in "Spike Jones effect," which I discuss below) or in order to re-create another manner of audiovisual, multiscenic theater, where noises and speech on the one hand and music on the other unfold in different spaces. The latter is the model produced or reproduced by *Star Wars* (1977), in which the symphonic music does not aim to meld with the numerous chirps and roars that constitute the "sound effects" portion (robots, machines, aliens, weapons) or to draw them into itself, but is rather situated in parallel, like another discourse.[20] John Williams's score helps out in this regard: drawing its timbres from the classical symphony orchestra, it cannot texturally integrate bruitist and electronic sound effects. On the opposite end of the spectrum, a film such as *Blade Runner* (dir. Ridley Scott, 1982) sets forth a seamless continuity between Vangelis's electronic music and the futuristic sound effects admirably orchestrated by the mixer Graham Hartstone. Let me just add that rarely are the three elements of the

canonic differentiation (speech, sound [*bruit*], music) in play at the same time. Rather, two of these elements confront one another, are assimilated or dissimilated, in pairs.

A typical effect of noise/music dissimilation that might be called "Spike Jones effect" (in honor of the bandleader of the famous comic orchestra, who often made use of it in his parodies of classical and popular standards and borrowed the principle thereof from the tradition of musical clowns) consists in replacing a note in a melody by a complex noise of a humorous type (of the "pffft" sort) or sometimes simply a percussive sound, which gives the impression that the transmission of the note has struck an impediment. In figurative terms, one has "hit a snag," as if, in the well-ordered enmeshing of the notes a recalcitrant obstacle was hidden.[21] Tex Avery's cartoons, especially those from the 1940s with music by Scott Bradley, make consistent use of this effect. In this case, the abundance of musical themes constantly emphasizes such noises as events or ruptures. Here, like the front-gate bell at Aunt Léonie's house in Proust's *In Search of Lost Time*, the *note* would be freely vibrating sound and *noise* would be sound that remains stuck in the source of its emission, that does not "take off"—in short, the rattle at the back gate. And this sometimes really happens: you can block the free resonance of a piano or guitar note and keep it from sounding. But at other times, the contrary happens: the application of tension or of an obstacle applied in a certain manner makes a harmonic jump out, "liberating" the note. The production of "harmonics," which have an immaterial tone, on the string of a violin or a guitar, made by blocking the string's vibration, is perceived as an otherworldly phenomenon.

In French, the verb *sonner*—"to ring" or "to sound"—means both the occurrence of a tonic sound and the free vibration of a sound until its extinction. The note in this instance would be that part of sound that gives off a value (clearly a pitch value) that emerges for perception like a brilliant color emerges from an object or from a mediating image. This emergence will allow the given sound to be linked in a chain of other sounds that have the same value but of varying degrees, composing among themselves, on the basis of their common character, pure value relations (in accordance with "musical law," as so aptly formulated by Schaeffer: "Objects stand out from one another in terms of value because of their similarity in terms of character"). The Spike Jones effect thus makes us laugh like a grain of sand that maliciously intervenes in this marvelous system and sends one of these sounds—the one that

blocks or gets stuck, that goes "bang" or "pffft"—both back to its causal origin and to its irreducible uniqueness. A single clinker, as it is called, destroys or contests—parodies but also affirms all the better—the entire procedure. Once again, we find ourselves faced with an "all or nothing" proposition.

Other directors, such as Coppola in *Rumble Fish* (1983) and Tarkovsky, seek in their films the contrary, albeit only at very precise moments: a gradation that calls on the propensity of our listening to hear notes everywhere, so to speak, particularly in the sounds of nature. Take the sound of the rain, or, to be more precise, a fine and dull rain, a depressing drizzle. When it falls on the pavement or asphalt, it is often a continuous and uniform, finely grained sound. Heard under the shelter of an umbrella or on a mansard-roofed apartment, as in the little "love nests" of Charles Trenet's songs, it becomes animated, vital, joyful, a sound that is a pleasure to hear and that gives Gene Kelly the desire to sing and dance. Why? Not only because you are sheltered, since someone who is on the second floor of an apartment and hears the rain outside without hearing it spluttering does not find its sound cheerful. . . . But because every drop by falling on the roof becomes individualized, because a melody of sounds [*bruits*], of little complex impulses arises, because each repercussive sound acquires energy, a fascinating dynamism—and perhaps also because there is the idea of an obstacle. The spluttering of rain on an umbrella produces jubilation because it is at the threshold of noise and of sound. Complex impulses of the type X′ (in Schaefferian terms) can become, by their differences with regard to "site," protomelodies, where a precise evaluation in terms of intervals is lacking.

In his use of sounds of dripping water—particularly in the film *Stalker* (1979), but also in the dull murmurs of the space station in *Solaris* (1971) that were produced with the help of the musique concrète composer Eduard Artemyev—Tarkovsky never stopped looking for that point of semimusicality where the cosmos or nature seems on the brink of speaking or singing, without us ever being sure of this. In one of the sequences in *Stalker*, for instance, when the travelers must cross through a tunnel the entry of which is blocked by a powerful waterfall, the composer mixed into the "white noise" of a torrential flow of water a sort of barely perceptible harmonic undulation, of the type of sound that one is not certain of hearing or is not certain of having heard. The semimelody, which is a sort of lament, that opens the harmonica theme of Sergio Leone's *Once upon a Time in the West* (1968) likewise numbers among the many examples of this "on the threshold of music," the principle of which comes moreover from those concert pieces or operas in

which the notes emerge from a confused murmur and the music narrates its own genesis. Examples of the latter include the overture of Wagner's *Das Rheingold*, the beginning of Debussy's *La mer*, Ravel's *Concerto pour la main gauche*, and, prior to these, certain orchestral introductions by Berlioz (the beginning of each movement of the *Symphonie fantastique*, for example). Cinema here takes over from symphonic music.

The feeling of sonic continuity among speech, noise, and music can also be produced with little cost by recourse to *dimensional pivots*. What I call *dimensional pivots*, in the universe of sound, are dimensions capable of creating a relation, an articulation, a hub between the sonic constituents of a film that belong to different families—speech, music, and noise—while leaving each to unfold in its own domain and aim at a different level of listening. The two principal dimensional pivots, those that are the most pregnant and the most susceptible to be abstracted from the sounds that undergird them, are—no surprise here—pitch and rhythm. When a "noise" element and a musical element have a rhythm in common, this allows one to create the illusion of solidarity between them. Or again, this will happen when a sound linked to the sonic ambience of the plot (e.g., a bass rumble) and another sound, in this case heard as part of the musical element, share precisely the same pitch interval. In vocal music, it is the presence of two-dimensional pivots—rhythm and pitch—joining the sung part and the instrumental part that hides from amateurs and even from musicians the radical gap between the listening level of the text and that of the music. In relation both to analysis and to aesthetics, the complete discontinuity of the Western musical system is thus masked, even though this system appeals to two different listening levels.

In cinema, dimensional pivots have been successfully employed. For example, at the beginning of the pilot episode of the television series *Twin Peaks* (1990–91), David Lynch puts in play a subtle effect of lag and dissonance between the notes of a chord heard in the accompanying music composed by Angelo Badalamenti and a sound belonging to the realistic sonic ambience (a foghorn or bell) that is slightly "off" in relation to the music. This is a nuanced way of playing on the dimensional pivot of pitch. The precise equivalent for rhythm is in fact an unrhythming or syncopation between the rhythm of sounds belonging to the action and the rhythm of the accompanying music. A subtle dissonance on the one hand and a slight out-of-time quality on the other are ways of linking the domains of noise and music while at the same time emphasizing their heterogeneity. With

imagistic ends, orchestral music in the nineteenth century already made occasional use of such effects. An example would be the off note in the "March of the Pilgrims" movement of Berlioz's *Harold en Italie* that, by being slightly out of tune in relation to the rest of the orchestra, evokes the tolling of a monastery bell in a countryside.

Sound cinema in the early years (roughly between 1928 and 1934) aimed at establishing a "unitary" symphony, and this is what everyone dreamed of: a symphony wherein the spoken word, noises, and music would melt together into the same kind, into continuity.[22] In Europe in particular there was a desire to reflect the sonic richness of modern music; a number of films by Julien Duvivier, René Clair, Jean Renoir, Alfred Hitchcock, and Fritz Lang frequently alternate between scenes of intelligible dialogue and scenes of collective speech, in which one catches only snatches of meaning, just as in "life": the babble of a bunch of policeman around a broken-down car engine (Duvivier's *La tête d'un homme* [*A Man's Neck*]); the hubbub of various conversations around a dinner table (Renoir's *La chienne* [*Isn't Life a Bitch?*], Duvivier's *Poil de carotte* [*Carrot Top*], Lang's *M.*); the ambient sounds of cafés, public places, crowds; and so forth. It is true that this method of verbal chiaroscuro fit nicely with the technology of the era, when the sound of spoken words was bound together by a sort of fortuitous paste of background noise.

At the level of the procedures used, we see quite clearly what sort of translation was at stake: the gradation of the intelligible into the unintelligible and vice versa. Notwithstanding, faced with many of these courageous and exciting attempts from the 1930s, which were subsequently left by the wayside as far as most films were concerned—except for a few by the likes of Max Ophüls, Jacques Tati, and Lynch—we get a feeling of stiffness and rupture. The exception is Jean Vigo, who found in *L'Atalante* (1934)—perhaps with the help of Maurice Jaubert's music—the magical formula for this gradation. Moreover, whatever the interest of these explorations and independently of the beauty of certain of these films, the spectator becomes conscious of the permutations of listening that he carries out (passing from linguistic listening to sonic listening) or the permutations of ambience, all the more so since these permutations bear on a component of the same substance. Thus, in *Poil de carotte* (the 1932 version) or the beginning of *La chienne* (1931), when an "atmosphere of collective speech" cross-fades to distinct and intelligible responses, we are conscious of toppling from one listening level to the other,

while the sonic material, human speech, remains the same. To my knowledge, Hitchcock is one of the only ones to have successfully pulled off the difficult dissolve from intelligible speech to unintelligible babble, and this in a scene from *Rope* (1948). To get there, he had had to try out many unfruitful attempts (notably in *Blackmail*, from 1929).

In dialectical fashion, these explorations led to a period in which the three components were again separated and each returned to its own home, with speech no longer anything but speech, noise but noise, and music but music—the different sound families subject to fleeting linkages by recourse to dimensional pivots. Toward the end of the 1930s, however, when these explorations were naught but disused exceptions, classic musical comedy would remain, among the array of film genres, the genre par excellence in which noises, music, and speech, instead of being superimposed on one another without paying attention to each other—which went for the majority of cases—still communicated, even if fleetingly. And at the same time, this is the genre in which from time to time links—brief to be sure, but precious and affecting—were forged between noise and music, so much so that the disparity or cleavage of everything labeled sonic into different levels of listening and elaboration, instead of being overlooked or passively accepted as natural facts, is in musical comedy more often than in other genres thematized and presumed, with the levels driven to contrariness and infringement.

That the inescapable and universal phenomenon of the privileging of tonic sounds because in sensory terms they stand out, producing for the ear a qualitative leap grounded in what is but a quantitative difference on the strictly acoustic plane, may have been interpreted culturally and ideologically as the basis for a "natural hierarchy" among sounds or a difference in spiritual value between "note" and "noise" is likewise problematic. As a composer of musique concrète myself, I am obviously not going to subscribe to such a way of thinking. It so happens in any case that in a film the emergence of a musical melody out of an assemblage of "noises" is endowed with a particularly large emotional power. This is because cinema, which is essentially composite, impure, disparate, and which mingles, alternates, or mixes all sorts of sounds, is the very medium that, most notably with the genre of musical comedy, takes on this disparity and at times enchants us by performing the ephemeral reduction thereof.[23]

Culturally speaking, as we have seen, noise has been situated in the West, since the beginning of the twentieth century, as being on the side of rhythm

and vitality. Regular percussion of a "complex" sound (without precise pitch), for example, a drum solo, is more convincing and more rousing than regular percussion of a tonic sound, where it is the "note" that monopolizes the ear, as if it were necessary for one element to dominate the other. On the other hand, the tonic note is symbolic of sound humanized and spiritualized. A particular emotion comes into being at this point, like a magic spark, when the difference between sound and noise is not forgotten or annihilated (this difference proceeds from too many different factors) but is employed because of the interval that it produces and because of the creative, fecund complementarity that it entails—or again, because it traverses the vertiginous, exhilarating bridge of a transition. At the beginning of *West Side Story* (dir. Robert Wise and Jerome Robbins), the genially employed opposition between the little brittle noise or *complex impulse* of the snapping fingers of the dancers and the accents—chords and tonic notes—of Leonard Bernstein's musical score is this entire dialectic in a nutshell.

But, as I have said, sound cinema was born during an era when musicians as well as filmmakers, not to mention artists in general, were looking for a unique fusion, in a single dynamic flow, of the modern and the primordial, of music and noise. Whence the importance of the sound [*bruit*] of tap dancing in the musicals of the 1930s, which was greater than those made in the 1940s and greater still than those of the 1950s. In the latter decades, with the sound recorded in postproduction rather than recorded live, tapping must not only be thought of as a sound effect meant to valorize the virtuosity of Ruby Keeler, Fred Astaire, or the Nicolas Brothers, but also as a noise qua rhythmic component driving the music. Other noises, those of daily life, can play the same role. Think of Rouben Mamoulian's *Love Me Tonight* (1932), the "awakening of the city" scene, wherein the sounds of early morning in Paris—household chores, small trades, and car horns—little by little take on rhythmic and symphonic order and inspire Maurice Chevalier to sing. Or consider the superb "musique concrète" of the ship's engine room in *Shall We Dance* (1937), in which a polyrhythm of machine sounds to which Fred Astaire sings and dances is gradually replaced by a jazz orchestra. These examples must be situated in this context, just as much as the urban, modernist, and progressive symphonies of Dziga Vertov (*Enthusiasm*, 1930) or Walter Ruttmann. As for the latter, the stunning sound-only film *Weekend* (1930) seeks, moreover, by using extremely fast editing that serves as a unifying principle, to create a single, seamless continuum of church, school, and hiking songs with the noises of craftsman and machines, along with human

speech. In Duvivier's comedy *Allô Berlin? Ici Paris!* (1931), the integration by sound editing of six telephones ringing at different pitches tries to make the latent melody contained in the noises emerge. But if there is a single genre in which this continuum is ceaselessly sought after—a genre that, although rarely recognized as such, is an eminent subsection of musical cinema—it is certainly the American cartoon of the early 1930s. Thanks to synchronization, every rustle and every clanging pot has in fact the potential to be integrated into a singing, rhythmic, dancing arrangement of the world.

Cultural and racial—one ought rather to specify "racialist"—categories also come into play. Thus, during the first decade of sound cinema, the "Negro," as was said at the time without necessarily a disparaging racist meaning, represented in American cinema he who draws his strength from the vital roots of noise. Robert Brasillach, who would later call for the elimination of the Jews, was not the last to enthuse about the musical sequences of King Vidor's *Hallelujah!* (1929) and their "barbaric ecstasy."[24] This film, which is furthermore magnificent, offers us several fabulous transitions, as, for example, during the preaching-in-the-open-air sequence: without having realized that a break has taken place, the rhythmic declamation of the actor Daniel L. Haynes becomes a song and the colorful imitation of the sound of a train by the harmonium becomes a musical composition. What sweeps just as much the viewer as the characters in the film into the same fever of conversion is not the song itself—which takes up only the final seconds of the sequence—but the very process of irresistible and progressive mutation from the spoken to the sung, in keeping with the spirit of the gospel music. The ensuing vertiginous panic is born of the loss of reference points that usually allow us to discriminate inflexibly between "sound" and "note," between "spoken" and "sung," between poetic and prosaic. But this vertigo presupposes that there are indeed two universes, two sonic registers.

Here we are on the other side, at the beginning of the twenty-first century where, notably in those quite numerous current films that are accompanied by a wallpapering of compiled songs, music is always already there somewhere, juxtaposed to the rest of the sounds and always ready to rise to consciousness and then recede into background, without nonetheless ever fusing with noise or protracting it. The sound world of today's films, faithful in this respect to our daily experience of such superimpositions, is no longer structured like a sort of tree that would extend its roots into the subterranean and nourishing soil of noise and grow its highest branches into the

heavens of music. Music and song must no longer be born of noise, but they become the emerging into consciousness of a continuity, of an uninterrupted existence from whence they come and whither they return, as if broadcast by an eternal radio station. But this world, our world, a world of juxtapositions and mosaics, which has for a while now given up on the utopia of the fusion and of the conversion of noise into music, this world such as it is, we love.

PART III • the wheel of causes

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6))) The Sound That You Cause

ERGO-AUDITION

A Sound Scene: Actors or Auditors?

The scene: a train station in the Far West, in the middle of the desert. The only voyager waiting for the train is a Native American woman. The only person working there is a toothless old counter clerk. Three sinister-looking men wearing dusters make their entry. They are in a state of reprieve, since they will only be on screen for fifteen minutes—the time it takes for the credits to roll—but at the end of this very long and famous opening sequence from Sergio Leone's film *Once upon a Time in the West* (1968), they will have been struck down by the character played by Charles Bronson. And so they arrive, chase away the squaw, and lock up the clerk. Three strong "impulses" resound, deliberately indeterminate in nature, situated somewhat between the door that is slammed violently and an explosion. The causal vagueness of sound allows for this. The three men have signaled to the clerk that talking is fruitless and amounts to no more than chatter. We thus comprehend that silence is for them a manly virtue that must be respected. So they wait for the train without saying a word, each to his own place. One of them, played by Jack Elam, a bad guy in numerous Westerns, has copious stubble; another has a graying beard; and the third is a clean-shaven and bald black man whom the film buff will have recognized as the actor Woody Strode.

Except for an intermittent wind, the only sustained sound in this long scene is a plaintive and drawn-out motif of three periodic, repeated, unlocalizable notes that the image will later reveal to be a creaking windmill. These three "tonic" notes are characterized by a peculiar accent, like that of a

voice, a sort of slight lagging quality that evokes the Canton de Vaud accent in Switzerland. For a while, this windmill is the constant element, the pivot, the grounding bass of the set of other sounds, but instead of making itself forgotten, it obstinately recalls itself to our conscious attention because of its exasperating, cyclical character. On the other hand, during another whole part of the sequence we no longer hear it, although Leone has made sure that this sound vanishes under the cover of another that breaks in, such that we do not notice its momentary absence.

Another "background" toward the beginning is provided by chirping birds, but this one does not attract our conscious attention. Against this background and in the framework of the train station, now empty except for the three men, nothing happens save for little events such as the following: a drop of water falls onto the shaven head of the seated and motionless black man—an event authenticated by a shot of the sweating ceiling above, which drips at regular intervals. Instead of moving, Strode places his broad-brimmed hat on his head. The sound of the drop falling on the fabric is now more muted. This is what I call the "*Shining* effect" (of which more later). As for the man with stubble, a buzzing fly walks across his face or hovers around him. He ends up capturing the pesky creature in the barrel of his revolver, capping it with his finger. He then lifts the blocked barrel to his ear as if to make the sound of the trapped fly whisper, as a means of mastering it. We hear an intermittent buzzing as the insect flies inside the barrel; the timbre of the sound coming as it does from within is muted. And the third waiting man, the one with the graying beard, slowly and deliberately pops his knuckles by pulling on his fingers.

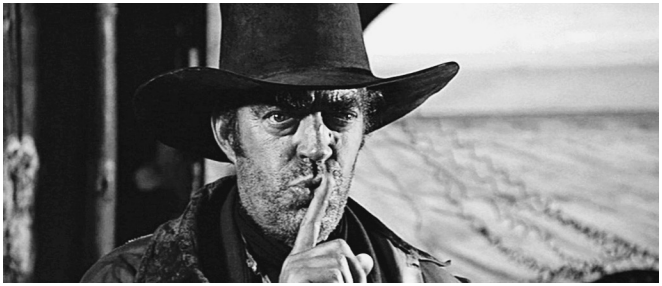
We could consider these various sonic events as a sort of sound zoo, so to speak, that presents us with different types, different species, suitable for filling some of the cells of Schaeffer's "typology" (see chapter 11). There are sounds with a mass that is complex (i.e., without precise pitch), such as the drop of water. There are others that are "tonic," with a pitch that you could sing, such as the fly or the windmill, even if in the case of the latter the notes are somewhat vague and slippery. There is a similar contrast from the point of view of duration: certain sounds, taken one at a time—the drops or the popping knuckles—are *impulses* (instantaneous sounds, like points in time). Others, however, are *continuous* sounds, such as the fly when its makes itself heard. Still other sounds are what Schaeffer calls *iterations*, that is, sounds extended by the close repetition of impulses. These, in short, are the equivalent of a dotted line, and such is the chattering of the telegraph machine that

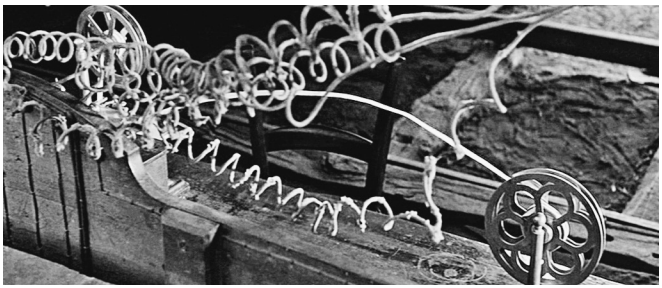
one of the bandits interrupts with a sharp blow—it is at this moment that the sound of the windmill, which will resume again later, also vanishes—as if for him it was too close to speech.

But we can also think about these sounds as they interact with the characters: the drop of water, the fly, and the popping of joints either are produced directly from their bodies or have an exterior reality that the characters nevertheless appropriate by finding the means to modify them. By putting on his hat, Woody Strode's character changes the timbre of the passive noise of the drop of water on his shaven head, and he takes the edge off of it. Jack Elam's character captures the fly in order to have it as his disposition in the barrel of his gun and to make it purr at will before letting it go. He too has "mastered" to a small degree a sound in his environment, since the color of the sound of the caught fly, resonating from within the weapon, has changed. The sound that the insect makes when trapped in the revolver's barrel is reduced to a pure fluctuation of intensity on a stable tonic note—a sign of what I call *acoustic decoupling* [*déliaison acoustique*].

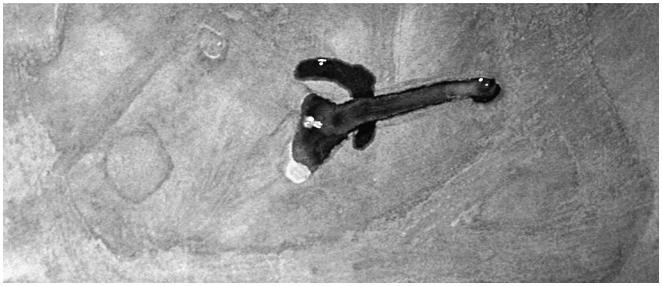
This insect, which we have already met in Victor Hugo's poem, reminds me of an entirely different matter that Leonardo da Vinci raises in his *Notebooks*: Is the sound of a fly produced by tubes or by the wings? Such a question, as ridiculous as it may appear, has a symbolic meaning. In effect, it comes to asking whether we are talking about a voice (intentional) or a noise (unintentional). Is it a signal or the epiphenomenal result of an activity, with no communicational intent? When the sound of the fly breaks off and gives us a respite, when either flying freely or caught within the barrel, we find ourselves on the lookout, as if it were the fly's turn to listen to us. When sound is interrupted, the silence listens to us.

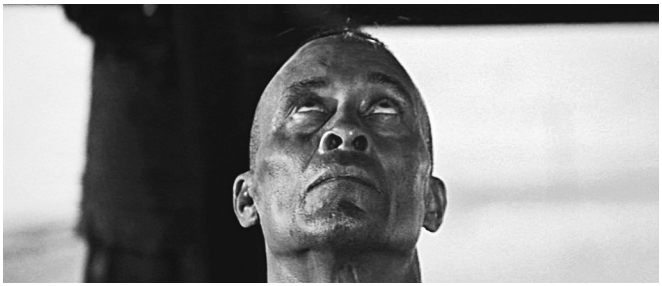
What are these noises doing in this instance? First of all, they emphasize the muteness. The noises are heard in relation to the silence of the characters. They stand out from them. The sound that you stop hearing or producing releases or allows other sounds, which you previously could not make out, come into perception. A sound must be silenced in order for another to exist. In this case, the sounds of the fly and of the drop of water, which have a very weak "weight-image," tense us for listening. They indicate to us, since we can hear them, that all around these minuscule events silence reigns supreme—that the natural world is quiet, unobtrusive. The same scene located next to a raging waterfall would be bereft of meaning. These sounds provide us with the general perceptual scale. The characters await the arrival of someone or something. We are being told that if the sound of a fly or of a drop of water

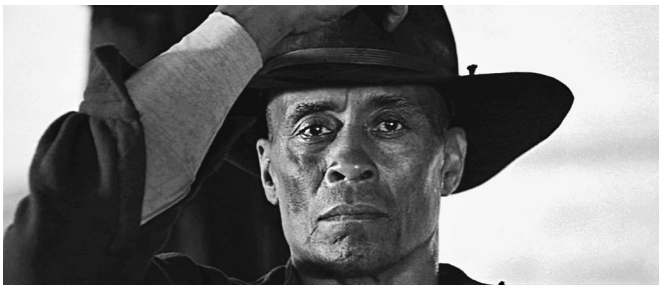




(above and opposite) *Once upon a Time in the West* (dir. Sergio Leone; 1968)







(above and opposite) *Once upon a Time in the West* (dir. Sergio Leone; 1968)

takes up so much space, the least noise coming from afar ought to be audible. But these sounds also put forward the relationship of the characters to the audible as mysterious. Does a given character take a noise or noises into consideration? Does he do so consciously or unconsciously? The man who places his hat on his shaven pate, does he do so to shelter his head? Does he do so in order that, without having to move, water might build up on the brim and he might eventually quench his thirst (a symbol of patience)? Or does he also do so in order to modify the sound? Such are the conundrums that cinema puts before us. In fact, as Jean-Louis Leutrat has nicely put it, the cinematic power to bring faces close up—and Sergio Leone is one of the directors who brings them the closest—emphasizes their opacity and turns them into face-down cards, so to speak.[1] We cannot know, among other things, what is happening with their own listening.

One sound in this scene has to be set apart: the one that the image identifies for us as coming from the windmill. It is with difficulty that we can prevent ourselves from hearing in it something vocal and from making it sing or lament—as if it anticipated the heartrending harmonica that Charles Bronson's character plays. We might also think of that lovely study of ergo-audition, likewise mute, depicted in a comic scene from Tati's *Playtime* (1967): the one in which Monsieur Hulot ends up in glass-enclosed waiting room where the silence makes the least sound a potential bother and in which he bides his time by playing with the sound of the chairs.[2] He spends several minutes together with a very fidgety businessman, who, also waiting and in a sort of state of sonic narcissism, moves about because doing so makes sounds. Leone's film and Tati's have something in common: the characters have opted not to speak, but everything takes place as if they had to fill the silence that their muteness creates. The bandit who cracks his knuckles, the Jack Elam character who traps the fly in order to keep the sound for himself, as well as the businessman who fills the time of waiting by signing documents. Yet these characters, who in both films demonstrate a sort of functional impassiveness, return us to the discomfiture that their silence creates. To an extent, both sequences also make the audience laugh, which wards off the silence that reigns onscreen. It all happens as if to avenge us for and deliver us from the persecution and the vexation that spring up one after the other when we experience this type of situation, wherein noise and silence take turns. The upstairs neighbor who walks about or moves furniture around and then pauses for a moment—or again, as with Leone, a fly buzzing in the vicinity that stops—is stressful in more than one way. For one thing, the cessation

of these sounds forces us to prick up our ears and attend to what we would rather forget. For another, they expose the fact of our listening as such. What creates a specific kind of persecution is the alternation of noise and non-noise, of voice and non-voice.

Many of the noises propagated through solids coming from the upstairs neighbors (such as dragged chairs or children galloping about and jumping up and down on the floor) are often intermittent, yet at the same time they indicate an ongoing presence. The people making these noises do not cease to be there. This intermittence produces a maddening doubt—the acousmatic doubt itself—where it seems that the silence produced refers us to our own listening as well as to the possibility of a reciprocal listening. An exceptionally quiet environment puts us in a position to be able to make out the smallest sound, but also to be able to be everywhere heard. Silence is then like a bright light illuminating us. This silence makes us vulnerable with respect to the sounds that we make, whereas the sound [*bruit*] of another's voice is like a mask in relation to any sounds [*bruits*] that we produce. The recent soundproofing of high-speed trains in France has created new problems, since there is no longer background noise to serve as discreet cover for voices. In particular, when in the same compartment or in the same car a traveler speaks on a cell phone with an inaudible interlocutor, it seems to us that the silence between replies and phrases is the very silence that catches us in the act of listening in on it. The effect is not in the least comparable to what happens if we listen in on both voices in a conversation or what would happen if we were able to hear the person on the other end of the line. In the previous case, silence—the gaps in the conversation—seems to clear a space for us to emit sounds.

Ergo-Audition and Feedback

Along these lines, I propose the term *ergo-audition* for the type of listening where the listener is at the same time, in one way or another, the emitter of the sound heard. And I would add that ergo-audition has its own laws and that these laws are different from those of audition alone (when one doesn't intervene with regard to the sound). The latter must nonetheless not be characterized as "passive" because invisible to the eyes, since in reality such audition is capable of mobilizing the entire person and engaging the best of his or her capacities. There is ergo-audition when an auditor is at the same time, completely or partially, answerable for, consciously or not, a sound

that is heard: playing an instrument, operating a machine or vehicle, making noises—footsteps, the sound of clothing, and so forth—on account of movements or actions, and, also, by speaking. In such a situation, a particular feedback is produced that, except in cases of learned deconditioning, can influence the emitter with regard to the nature of the sound emitted or controlled. For example, we are usually much less conscious of the noises that we ourselves produce by movements or actions than we are of those that others make (except in those situations in which we are trying not to be heard or, conversely, when we are trying to attract attention). In particular, someone driving a vehicle tends to underestimate the noise created by the latter.

Inversely, situations where the sound is the product of a concerted and conscious physical effort, directed toward the sound production in itself, often lead to errors or at least to differences in the evaluation with regard to the result. Thus the beginning percussionist who hits the cymbals with great force is led to believe that the sound resulting from this action is more powerful whereas perhaps it's quite otherwise. Similarly, a novice singer might—wrongly—think to produce a sound that carries by committing more physical effort to its production. For the instrumentalist and singer in question an entire apprenticeship is required, with the help of a teacher, in order to avoid being deceived by what they are doing. In effect, only the help of another ear or of a patiently acquired ability to listen to oneself critically—a true education in the relationship between doing and hearing—can disabuse them.

And yet "making noise," as we say, is often not the purpose of the action. With regard to labor, noise functions to regulate the efficacy of a hammer's blow, the proper forward thrust of a saw blade, the manipulation of a tool, or one's own steps. Variation in the "harmonic timbre" (the specific color linked to the harmonics of a sound) of the noise produced when filling a receptacle is a common guide for a barkeeper or anyone who either pours a drink for someone else or serves herself. The young blind woman of whom Diderot sings the praises in his *Lettre sur les aveugles* [*Letter on the Blind*] and concerning whom he writes, "If someone poured something for her, she knew from the sound [*bruit*] of the liquid when her glass was sufficiently filled," had acquired this perceptual ability, a good example of ergo-auditory feedback.[3] Whether it's a bucket of coal being dumped into a stove (a sound once quite familiar that has become rare indeed since the 1960s), a glass being filled with liquid, a container of sugar or salt being refilled, it is always,

with widely varying time scales, the same sonic effect of change in harmonic timbre that serves as ergo-auditory point of reference. This is a subtle sensation and one example among many of those familiar and typical sonic profiles that practically nobody explicitly recognizes and spots as such and that are nonetheless universal enough "archetypes." Likewise, pretty much the world over, peeling a fruit or a vegetable produces distinctive variations in harmonic timbre, with which the peeler is familiar and by which there is auditory verification of the current stage of the operation, albeit it also seems to provide a distinctive oral satisfaction.

Human beings start life with the emission of powerful sounds that carry far, but we are not conscious of making them (deaf infants, besides, cry like the rest). As adults, this lack of attention to a large portion of the noises we produce continues, and only under certain circumstances do we become conscious of them, as when trying to conceal ourselves or make our presence forgotten. Fortunately, moreover, we cannot constantly listen to the sounds we make. Just as we must almost continuously scotomize certain of our visual perceptions (e.g., our own noses, which are seen from a different angle by each eye), we must—in a much more basic and systematic manner—scotomize most of the time, so as not to be deafened by, the internal noise produced by our chewing. Powerful feedback reflexes help us to do so.

The Audio-Phonatory Loop

Over and above the situation of mirroring proper, albeit with clear reference to the mirror stage, "self-seeing [*le 'se voir'*]" (I have seen myself) is the same as perceiving oneself though another's eyes—or indeed through the eyes of the object—as a finite body in space. We might wonder if "self-hearing [*le 's'entendre'*]" is equivalent. In fact, "self-hearing" is of a different order entirely. We do not hear ourselves walking at a distance, whereas we do figure our bodies, our person, as a visual point in space. Even if we hear the "return" of our own voice coming live from a far-off loudspeaker—a situation familiar for lecturers and even, thanks to church acoustics, to preachers of yore—the fact that we simultaneously hear ourselves interiorly changes the givens: it creates a continuum between "hearing oneself from the inside" (through internal vibrations) and "hearing oneself from the outside" (through the ears, by reflections off the walls, through a loudspeaker if one is amplified, etc.), and this continuum binds the one to the other. I am here talking about

the voice that is peculiar to us as self-hearers. The voices of deaf persons who have learned to express themselves orally (in tandem with learning sign language, which happily is no longer proscribed) only possess that particular timbre because those uttering do not hear themselves.

In *Voice and Phenomenon*, Jacques Derrida had the virtue of underlining the importance and specificity of "self-hearing."[4] He does not, however, investigate the oddness of this situation, which in my judgment he turns too quickly into a "seamless" experience of self-presence. Occupied with his discovery, he does not appear to ask a single question about the complexity of a process that couples not only a will with an effect but also external perceptions with an internal perception that, while bound to one another, do not merge. Furthermore, we speak with a voice that has never been originally "our own," but rather with one based by and large on the incorporation of other voices, which we have transposed. In actuality, we hear speaking before hearing "ourselves" speak, and the starting point for speech is the imitation of adult voices that we imitate, transposing them up by an octave or two. Isn't there here something of that alienation already spotted in the "mirror stage," even if its modality is different? Except that the mirror image, if we are to believe Lacan, is totalizing because totalizable. Not only is the image of "self-hearing" nontotalizable, it is also alienated into a will-to-speech. Our voice is on the whole foreign to us—as much when heard from the outside as when heard internally. If the visual mirror sends us back our image even when we remain immobile and inactive, the vocal mirror—if such can be said to exist, since this comparison is made sometimes in relation to "self-hearing"—implies for its part that we speak and therefore that we project a certain intention that prevents us from listening to ourselves objectively (except for stage and singing professionals who ceaselessly correct by ear what they emit).

It has only been a bit more than a hundred years that, thanks to technology, human beings can hear their own voices recorded and objectively. Notwithstanding, we come across in certain settings that existed already two thousand years ago, such as mountain passes and town squares, an echo phenomenon that entails both a significant temporal distancing and a fairly precise restitution of timbre such that one can really hear one's own voice from the outside and from afar. One hears, that is, not only the word that was pronounced but also the timbre with which it was uttered. The experience of this is bizarrely striking even in the era of tape recorders. But (recorded) external "self-hearing" is obviously an experience that

has become progressively more widespread. For quite a while, the difference between the voice as heard internally and the same voice such as it resonates for others could be attributed to imperfections in reproduction media. Today, we know that the reason for this difference is a fundamentally different listening position. Upon hearing our recorded voice for the first few times, we have all had the experience of hating it and finding it too high-pitched and much less full than we had imagined. This experience is a universal one and appears not to admit of a single exception. In the 1950s still, it was rare for someone to have heard his or her own voice from the outside, so to speak, and it was usually not recognized as such when heard for the first time. At present, millions of people and almost everyone in some countries have had the chance to undergo this experience via an answering machine, video camera, cassette recorder, or digital recording device. And the initial displeasure that comes from hearing one's voice remains the same as ever. Only those whose profession leads them to hear it often will get used to it, at the same time that they often learn how to speak "for the microphone."

Is the echo tantamount to the mirror? Some psychoanalysts such as Didier Anzieu, drawing on the myth of Narcissus and Echo that links the two, have affirmed this to be so.[5] The echo of which the myth speaks presupposes a time lag. And yet simultaneous echoes—or almost simultaneous, relative to the scale of human present—exist: the constant reflection of our own voice returned by the environment. We become conscious of this reflection when, on rare occasions, it goes missing. The problem is that, for reasons related to the physics of sound, this sonic mirror becomes mixed up with the "original."

The "Shining Effect"

I piss on the
Dead leaves
A rustle
—Hōsha, in *Fourmis sans ombre: Le livre du haïku*, 1978

This sanction from a Japanese poet will allow me to approach an aspect of our relation to sound that, at a time that styles itself modern and liberated, is only mentioned with reticence and titters. I will be talking about sounds produced by bodily functions. Noise is often given a primal association with

physiological sounds that are initially involuntary: those of micturition and defecation, which produce socially taboo sounds and are all the more troubling insofar as nothing sets them apart from sounds of an entirely different sort. There may be no difference between the sound of a fountain and that of a stream of urine. The difference between such sounds is produced not by the nature of liquid but by quantity and strength, as well as by the spot onto which the stream falls.

It is possible that this identity, which is a consequence of the representational vagueness that is a particular feature of the sonic domain, leads us to consider the hearing of sounds that ought to appear familiar, pleasant, and poetic—exactly like the sound of a little stream of water—as indecent. The visual evocation of a garden hose may certainly lend itself to sexual metaphors, but it is not ambiguous or amorphous in itself. The sonic evocation of an intermittent stream of liquid is favorable to embarrassing or comic ambiguities. Yet the poem quoted above alludes to a precise sound. In fact, as every child experiences, urinating onto various surfaces or into various receptacles makes different sounds—just like tapping in the same way on various objects, shaking in the same way various toys, and so forth. Further, so doing procures a specific enjoyment, whether associated or not with relief or with physical expenditure (when you are walking down the road and come across an abandoned beer can, it is difficult to resist the pleasure of kicking it). With an infant, when it comes to such games, there is an aspect at once exploratory and motor-sensory. The adolescent and future adult will preserve this ergo-auditory pleasure when revving the throttle of a motorbike, noisily slapping down cards in a game of pinochle—or shuffling mahjongg tiles in some Asian countries—and so on.

In the Greek poet Theocritus's idyll *Thalysia*, a character addresses the narrator as he hurries on his way: "The pebbles sing as they spurt from under your boots."[6] The sound of our footsteps here expresses vitality and happiness. We find it a joy to be so linked to the world, to the environment. But the note sounded by the pebbles belongs to them and is their reply, and it is here that a specific pleasure is produced, which one film among others has expressed and captured completely. Ever since Stanley Kubrick's film *The Shining* (1980) came out, I have been very struck by the attention that one of its scenes never fails to generate. This is the scene in which Danny, on his tricycle, races through the endless corridors of the Overlook Hotel. The camera follows him at his level, and when the trike passes over a rug, the rolling sound changes and becomes muted; when it returns to the hardwood floor, it

changes in strength and timbre, and so forth. Nothing could be more banal. It's like what happens when a train passes over a bridge and then returns to the ballast on firm ground, with this difference only: in this case the child powers and steers the vehicle with his little legs. But this difference counts for a lot in the memory that we have of this short sequence, as if we rediscovered something of childhood in it. In honor of Kubrick therefore and despite the fact that you will find it in other films as well, I have baptized as the "*Shining* effect" that delight born of a selfsame action that yields a different sonic response and that thereby activates the ergo-auditory loop, beckoning us to endless explorations of *the world as it sounds*. Even the sound of our steps is not completely incorporated by us as being part of us. It is like the response of the ground, the response of the world to our actions, and it thus sets off the ergo-auditory trap—that loop that ensnares us in its ever-varying sonic replies.

Perhaps it is not a matter of indifference either that in this film we are talking about a little male. The ergo-auditory game has perhaps a specific meaning for boys, who play at directing their urinary stream and "mastering" the sound that it makes in relation to the surface onto which the stream is directed: dry leaves or loose soil, earthenware or water, and so forth. The sound becomes a symbol of phallic mastery but also a narcissistic trap. The very fact that the sound produced corresponds—even if and particularly even if only in part—to the action carried out sustains a particular feedback loop, and this is the trap of which I spoke: one never fully disengages from it, whereas one would disengage in two comparable cases. In the first of these, the sound would slavishly reproduce the intention linked to the action carried out. In the second, conversely, the former would only have a random relationship to the latter.

The "*Shining* effect" is thus linked to a systematic noncorrespondence between sound and cause (or between action and effect). Its spell is cast by the brilliance of the effect. Yet the ergo-auditory loop only has to do with a part of the sound: it leads us to feel, in what follows on, what in the sound is not the direct result of our action, what escapes our control, all the while extending that action. Here, we need to distinguish among various cases:

- Those where the sound is more or less isomorphic with the action, as when one plays with the accelerator of a car or motorbike. In such instances, the finest nuances of "sonic response" to the action suffice to bring about ergo-auditory pleasure.

- Those where there is isomorphism, but subtle and staggered: a held note on a violin does not tell us the story of the back-and-forth of the bow.
- Those where the sound is not isomorphic with the action, as when one momentarily arouses something that then goes off on its own way. This is the case of the bell of which Claudel speaks and that puts one in the position of a trigger: "A single scrape of the fingernail and the bell in Nara starts to rumble and resound."[7]

Not listening to something that we have triggered until the end is the most up-to date version—as if we had liberated ourselves from the weight of listening. "Triggering" or making something "sound" that then escapes us is something that also features in many video games.

As Heraclitus said, "It is not possible to step into the same river twice," and a torrent's water as it roils along unmoving banks and bed is ever different—at least as far as our human time scale is concerned.[8] Yet the sound that it makes is massive, uniform, and statistically constant. If we move the length of the flow, or if we get closer or farther away, the sound does not cease to change in pitch, and we get very different emphases depending on the position of our ears. At stake are those noises that I call "sounds points," the (statistical) stability of which emphasizes the effect of changes in our distance and in our attention on them. This sound, rich in high pitches—and therefore allowing subtle apprehension and localizations—puts forward one characteristic: it noticeably changes in harmonic timbre if you only barely move closer or farther away or if you turn your head a bit more or less. A person with a slight hearing deficiency in one ear in relation to the other, which is often the case, will thus hear more or fewer high-pitched frequencies (which are more directional) depending on which direction the head is turned and which ear is turned toward the source. We are then caught in a loop where there is something like a hint of intentionality: the sound, as it transforms, seems to "reply" to our movements. We are halfway caught, halfway trapped in an ergo-auditory loop. But with sound we do not have, as we do for a tangible object, the feeling of permanency of appearance and texture. The permanency in this case seems too "moldable." It isn't really, but its unity breaks loose from conscious, elaborated, and reasoned labor. Compare this with a visual object: with a turn of the head, it disappears. If these objects remained in our field of vision and their texture shimmered when we moved, this would provide us with an instructive equivalent.

Once More into the Ergo-Auditory Loop

With certain games that are already dated, such as pool or table football, sound is a reward, as when we hear the ball drop into the right hole. A video game player not only plays to win, to score points, or to beat a competitor, but also to actuate sounds, at this point electronic ones—punctuating beeps, motifs of triumph and of failure. It is just that these sounds are always the same and are not produced by the actions themselves. Their delayed setting off is the source of a certain charm, of a specific enchantment. Electronic devices have changed the traditional rules of the game with respect to ergo-audition because—whether it is a matter of four beeps, that is, "tonic impulses" in Schaeffer's terms, that in France accompany the entering of a credit card PIN code or the warning sounds that indicate that we haven't hit the right key on a computer keyboard—these devices put forward sounds that are indifferent to the force or expressiveness of our actions, and all they do is punctuate our actions or respond to them by "protesting" (a repeated, iterative beep if you hit the wrong key). Likewise, whether you press weakly or strongly on the key of a cheap electric piano, the sound remains the same, and a more expensive model is required in order to return to a situation where our actions have a notable influence on the sound—a better interactivity, the very interactivity that the least acoustic system provides for nothing.

Certainly, the lack of correlation between the force of the action carried out and the volume of the sound produced was for centuries already usual for harpsichordists and organists, whose instruments do not register the influence of the strength of the attack on sonic intensity. But these musicians only represented a very small minority of humankind and, furthermore, the mechanical nature of instruments such as the harpsichord or the organ inserts into each sound subtle variations of attack and of resonance, which means that a note is never exactly the same, even if its volume does not "obey" the action of the instrumentalist. Above all, we live today amid sounds that are no longer the "natural" punctuation of actions but are rather kept in place or added so that ergo-auditory feedback functions correctly. It is not the electronic keyboard itself that makes noise. That beep is added, created, isolatable, and thus adjustable (our computer keyboard gives us, for example, the laughable choice between a duck's quack or a drop of water). The modern cash register is a very telling instance. The supermarket cashier is alerted by a sonic beep that the bar code corresponding to each product was indeed read by the laser beam, but this beep is uniform and is not dependent on his

or her action. The cashier deals with a thousand different products that must be grabbed and passed in front of the beam in a different fashion: bottles, jars of yogurt, items of clothing, and, to each of these complex, tiring, and varied actions, a single, indefatigable type of sound responds.

This situation, in which the contrast between the variety of actions and the uniformity of the responding sound is at its maximum, unsettles the ergo-auditory loop, dispossesses us of a portion of our active influence, and entails, as compensation, the myth that there are sounds for which we are totally responsible and of which we are completely productive. The myth is not true, or at least not automatically true. Even when we speak, when we form a vocal tone, we use an instrument that, although situated within us, is foreign. And you do not make an instrumental sound your own without long practice.

7))) Sound and Its Cause

CAUSAL LISTENING AND FIGURATIVE LISTENING

The Two Poles of Sound

One of the most famous sounds in world literature can still be heard and triggered today: the sound of the rattling bell attached to the garden gate of Aunt Léonie's house that Proust describes at the beginning of *In Search of Lost Time*. The sound is made when one enters the back way. In the little Norman town of Illiers—Combray in the novel—in the house that the writer used as his model, a visitor can still ring this celebrated bell, under the aegis of which I begin this chapter on the link between sound and its cause. There are two poles between which a given sound—or its perception—can be situated. It can be trapped in the cage of its cause and so made an index of a discourse about its cause. Or it may be allowed to freely resonate and to sing and escape into the air and from its causal fate. I think that Proust had this distinction in mind when he opposed the two typical sounds associated with entry into the childhood home in Combray: one cleaving to its cause and the other escaping from it. On the one hand, there is the "large and noisy rattle which heralded and deafened [. . .] with its ferruginous, interminable, frozen sound any member of the household who set it off by entering 'without ringing' " (thus, the intimate, the familiar). On the other, there is "the double-tinkling—timid, oval, gilded—of the visitor's bell."[1] Not without humor Proust reminds us that in Combray, for those entering as friends from the back of the garden, to go in "without ringing" means to make a noise that in effect does not ring in the sense of resonating. Proust is a writer who is meticulous in his choice of terms, and I would add that in

the rhetorical balance that he sets forth we find the opposition of the cause itself to the sound: here, the gate bell or "rattle" (a word that indissolubly agglomerates sound and cause); there, the sound or substantive "tinkling" that consecrates, with a precise sonorous characterization, the emancipation of the sound from its origin.

This rich evocation condenses several other oppositions. The writer juxtaposes the more material and impure sound of an "iron noise," caught within its own shell, to a "tinkling." The latter is a sound provided with a note, uprooted from causality and escaping into space. Perhaps it is the particular curve of its resonance—the unfolding of sound in time—that evokes an oval shape for Proust. But he also juxtaposes a noise that is unintentional and triggered by pushing the gate of which it is a part to an intentional one, made by pulling a cord. The bell is, moreover, the perfect symbol of the source insofar as it can either signify sound without prolongation when its vibration is damped—prisoner of the shell that denotes and doubles its character: metallic, closed, delimited in space in time—or, on the contrary, when its vibration is left free, a sound that escapes its source, that spreads out in both space and time, thanks to the prolonged resonance of a single note. Needless to say, the note that it sounds heads toward extinction all the while leaving a trace and an impression. The alternating pulse of the bell—both the interval that allows the clapper to strike against the wall and an oscillation of two or three notes—is the very symbol of the constant generation of a sound, the renovating motion that frees a sound from its cause. Conversely, the buzzing bell of the gate is the titillating symbol of a sensation trapped in its object-origin. And it is thus that filmmakers such as Jacques Tati (*Jour de fête*, 1948) or Luis Buñuel (*Belle de jour*, 1967) who might be called dry and distrustful of overflowing emotions and sensations—they are in fact sentimental and lyrical—frequently use it.

A memorable poem by Verlaine begins with visual impressions:

The sky is, above the roof,
So blue, so calm!
A tree, above the roof,
Rocks its palm.

[Le ciel est, par-dessus le toit,
Si bleu, si calme!
Un arbre, par-dessus le toit,
Berce sa palme.]

It continues, however, with sonic impressions:

> The bell, in the sky that you see,
> Gently chimes.
> A bird on the tree that you see,
> Sings its lament.
>
> [La cloche, dans le ciel qu'on voit,
> Doucement tinte.
> Un oiseau sur l'arbre qu'on voit
> Chante sa plainte.][2]

Taken from a poem in the collection *Sagesse* [Wisdom] that registers the impressions of a prisoner—the author himself—from his cell, these lines are remarkably eloquent. The poet does not say that you see the bell itself in the sky, but rather that it is in the sky (the image that you see) that the bell tolls (the sound). Insofar as it is a visible object, the bell is in the bell tower. Yet its tolling (the bell-as-sound) is in the sky. Likewise, the bird is somewhere in the visible tree, but you don't see the bird: you hear it. The sky and the tree "that you see" evoke a perceptual frame for the sound, which is drawn by the window of the cell. If the bell is a preeminent symbol of sound insofar as it spreads beyond its cause and fills the air, this is precisely because, as cause, it is absolutely circumscribed and complete: a bell has everything it needs to make sound, including the part that strikes and that which resonates. And this form, which is so sharply defined and so characteristic—so concentrated in spatial terms—denotes the cause as a single point.

From this perspective, an auditor more or less confines sound within the limits of its cause depending on whether or not it involves details of shock, unevenness, friction, and so forth, that I label *materializing sound indices*. With this expression I designate any aspect of whatever sound that makes us perceive more or less exactly the material nature of its source and the concrete history of its emission: its solid, gaseous, or liquid nature; its consistency; the contingencies attending its unfolding, and so forth. A given sound entails more or fewer materializing sound indices, and at the outer limit, none at all. Many lead a sound back to its cause; very few liberate a sound from it. These indices often consist in unevenness or irregularities of the sound in question, which reveal the resistant nature of its source. A voice, a footstep, a note can consist in—in a live listening experience just as in a film or in a

piece of musique concrète—more or fewer of them. There is the clearing of the throat and breath in the case of the voice, the rustle of footfalls, minor contingencies of attack, resonance, or precision in a musical sequence.

A sound untainted by any source—a "virgin" sound, to intentionally invoke a connotation-rich adjective—does not exist, although some have dreamed of it, as if the cause was the impure womb of noise. It was believed to have been found in so-called digital sound synthesized by computers, calculated from numbers, and thus in principle born from no material seed prior to becoming an electrical oscillation transmitted to the terminals of a loudspeaker. It is not a question of denying the acoustic exactness that current technical systems can achieve any more than of denying the extreme purity of silence that they can vouchsafe. What I am rebutting is the relevance of a rhetoric that would oppose in absolute terms—as all or nothing—"digital" sound to another called "analog" (the source of every sonic sin and of all lowlife glamour).

First of all, let's recall that the expression "analog sound" designates nothing coherent. Rather, it only means—by the process of elimination—everything that is not digital. In the same way many cultures have a word that means every other individual insofar as he or she does not belong to that particular culture. When you talk to laypeople or even to professionals in the film industry about digital sound, they suppose that it has to do with a better sound: one without scoria, supposedly perfect. And they put their trust in the label. If the myth of digital sound is so enticing, this is because, on the one hand, it fits with the *causalist* conception: digital sound equals sound made by computer. We thus know whence it comes, and there are no intriguing doubts about its origin. At the same time, it cleanses the notion of cause, all the while maintaining it, of anything potentially organic, repugnant, or dubious. We'd like to think that digital sound cannot be dirty and ambiguous like those rumblings, gurgles, moans, cries, and farts from which music has been produced. While no one standing before a beautiful painting is blind to the fact that the materials used in its making may be of humble origins, the notion that you can make a beautiful sound out of a piece of cardboard still shocks the vast majority of people, including musicians. Cause continues to be considered as that which ennobles sound, and the digital incarnates the idea of an absolute origin, uncontaminated by the vulgar everyday.

Must Sound Be Locked Up?

In *Appearance and Reality* (1987), P. M. S. Hacker judiciously remarks: "Language contains expressions such as 'sound fills the room' and 'sounds fill the room.' It would appear that such expressions are true because of the diffusion of sound waves within the space of the room."[3] Casati and Dokic, the authors of *The Philosophy of Sound* who cite Hacker in this regard, aim to refute this position by objecting that the statement about sounds filling a room "expresses nothing other than the fact that sound is audible from each position within the room."[4] The truth is that the latter are on the trail of a sonic source object. Yet the fundamental problem remains that this source object, within whose bounds the authors would like to lock up sound, is often impossible to locate. The clearest example is the statistically constant flowing noise that we perceive when we find ourselves next to a brook or a stream. The object that causes this sound has no bounds. The flow of water constantly renews itself; the sound that we hear is the sum of myriad local displacements. Moreover, in following the course of the stream, the source is spatially diluted.

When they treat the question of sonic provenance (whence does it come?) and sonic localization (where is it?) as incompatible and irreconcilable, Casati and Dokic pose the problem correctly but without allowing themselves to resolve it. There is a dialectic between localization and provenance: one cannot totally crush the latter with the former (sound is localized *there*, whence it comes to us) or localize sound as identical to the space in which its waves propagate. Nor can one get rid of one side or the other. Everything results from the false problem that consists in wanting to *lock up* sound, so to speak, within a spatially delimited cause, like a genie in a bottle. Sound is not graspable outside of a dialectic between the place of the source and the place of listening—a dialectic between the establishment and breaking of bounds. As Denis Vasse has admirably theorized with respect to the voice: "The voice lays down the boundary across which it cuts."[5]

The difficulty of localizing sound has led some to attempt delimiting and anchoring it in a precise spatial position, with the hope that these boundaries—on which its objectivity would be based—might be found within the boundaries of the source itself. This is one form of *causalism*. Leaning heavily on the work of Vasse, I have in *The Voice in Cinema* shown how it is simultaneously impossible to not fold the voice back into the body and more generally to fold sound—or at least certain kinds of sounds—back into its source. Otherwise the world is literally indeterminate and haunted.

At the same time, for the voice this movement is unceasingly frustrated and unceasingly resumed. According to a certain conception of human maturation, growing up would consist in understanding that there is an objective and consistent world in which objects keep to their places and we keep to our own. If an object gets bigger, it is not because it has actually changed; rather, I have gotten closer. As for sound, this would consist in no longer taking sounds as coming from us and in knowing how to relate their changes to our actions and movements. Or perhaps in attributing as outlines, so to speak, the sources to which we relate them.

In his *Treatise on Sensations* (1754), Étienne Bonnot de Condillac used a statue progressively attributed with senses as a thought experiment about the learning process. Likewise certain psychologists, including Jean Piaget, would later attempt to observe and to formalize the stages by which a newborn comes to know the world. It was thus that Condillac imagined his statue at first taking sounds as parts of itself, next recognizing them as being outside of itself, with the help of the experience of having triggered them. Thus, having picked up a "sonorous body"—the author doesn't specify, but we imagine a rattle—the statue "hears sounds when it shakes it, and hears nothing when it stops moving it."[6] He continues: "Therefore instead of perceiving sounds as aspects of its own being, it perceives them as ways of being of the sonorous object. In short, it hears them in the object." In fact, as we shall see, hearing a sound in the object and returning it to the sender is a way of getting rid of the problem that sound poses regarding its location. This location does not always have the bounded form of a rattle or a gate-bell, which seems to enclose sound within. For if the sonorous object has something of a boomerang quality about it—returning to *there*, whence it was thrown—it also has a propensity, as soon as it has left its causal container, to be everywhere at once. Furthermore, what we have here is also a typical example of the ergo-auditory loop, where the auditor is also the implied agent of the sound. "Every sound," writes Condillac, "appears [to the statue] as coming from outside." In putting it this way, the author also doesn't pose the central question—which is almost always obscured—of our own voice. This we hear simultaneously as within and without (as Derrida writes, it is a matter of "hearing oneself speak [*s'entendre parler*]").

The *reprojection of a sound onto its source* is not a point that is easy to grasp. As Claude Bailblé puts it: "The auditory image [is] folded back onto the source object and seems to merge with it. This gives one the impression that it exists outside of the object and is superimposed onto the object."

He continues: "The reprojection toward the source of sensory excitation is the fundamental characteristic of those perceptual systems that work at a distance."[7] It could be that for sound this is only partially true, and other writings by Bailblé paint a more complex picture: sound is simultaneously within us and outside of us, just as it is simultaneously in the source object and outside of it. In the case of the auditory object wouldn't there be the following particularity: That it involves an incorporation of sound that is linked to self-listening? My hypothesis is therefore that *reprojection onto the source in the case of sound is only partial and that sound is not anchored to the source as solidly as in the case of visual reprojection*.

This movement is double. There is of course the process that I have called *spatial magnetization*, which is observable in the case of cinema but also in situ. In this case we project sound not whence we hear it coming but rather onto the place where we see its source. At the same time, the sound that spatial magnetization makes us project onto the visible cause (either onto the movie screen or in reality) is equally localized *outside* of that cause, in *various points in space* (this is what our ears perceive because of the usual reflection of sound off of walls and various surfaces), as well as sound appearing simultaneously within us and without.

A consistent, general theory of *spatial* sonic perception would require too many conditions coming together that only do so exceptionally. There are in fact several variables:

- The isolatable character of the cause or "causal complex"—the possibility of cordoning it off spatially—cannot always be taken for granted (as in the example of a stream).
- A sound emitted at a low power from a given point in a closed room does not produce reverberations because of its weak acoustic energy. Holding other variables equal, the same sound emitted at higher power will produce reverberations. Its spatial nature will then be transformed by the modification of a single criterion (in this case, intensity). This experiment is easy to carry out by reproducing a given sound with a loudspeaker and simply turning up the potentiometer.
- The image of a subway train is totalizable. This means that the various visual and motor perceptions that we have of it—from close up, from afar, from the outside, from the inside—come together into a relatively unified image. The subway train does not constantly transform itself like a silly-putty image. But this is precisely what happens with

> the train's sonic image. Its sound is not totalizable. First of all, it has fundamentally to do with events. Subsequently, there are no significant changes of perspective.

All localization is a cross-checking of data. Spatiality requires cross-checks in order to be produced. This is rarely the case with sound. Take a few measures of orchestral music, with an interplay of double basses, first violins, traverse flutes, and so forth, and in which there are rapid and considerable contrasts between pianissimo and fortissimo. Let's treat this as a case of live listening. The ensemble that makes up the sonic source is encompassed within a visible, tangible, and, in a word, homogeneous space. We would be tempted therefore to speak of "the sound of the orchestra" and to suppose that this sound has a sort of spatial coherence. But the sound of the orchestra does not, so to speak, withdraw into a homogeneous sonic space. If we take the various sections one by one, the sound of the lowest instruments—the double basses—will already be seen to have different spatial properties than that of the small flute, which doesn't diffuse in space in the same way. Moreover, the variations in intensity, from measure to measure, at every moment change the spatial characteristics of the sounds: the pianissimo parts will not reverberate and reflect in the same way as the fortissimo ones, and so forth. If we now take a single instrument, what permits us to localize the sound of the double bass is not its sound as a whole but rather a particular detail: the attack-transient components of the notes. The sound coming from a double bass does not spread out in a homogeneous manner in space. There is no spatial homogeneity of the sound of a double bass—or of any other instrument whatsoever.

In a general sense, there is no spatial homogeneity, in terms of localization, of the phonogenetic wave or *verberation* emanating from an ensemble such as an orchestra, or of a cause such as an instrument. There is no solution but to situate sound in the symbolic comings and goings between cause and sensation.

Causal Vagueness

The matter of "causal vagueness" would be yet another feature that dampens sonic specificity. In fact we shall see that it opens a wonderful field for creativity and imagination. Simplifying, we might say at the outset that three laws govern the relation between the sonic world and the reality that causes it:

1. Ninety-five percent of that which constitutes our visible and tangible reality for most of the time emits no sound. That is, we could always make a recording in whatever spot and there would be no sonic expression coming from that 95 percent: not from the walls of a château, not from mountains, not from objects in a cupboard, not from clouds in the sky, not from a windless day, nor from humans when they are not moving or are too far away to make out their breathing—none make the least noise.
2. The 5 percent that is sonorous translates very little, vaguely, or not at all, the reality of which it is the sonic aspect. This is what I call *causal vagueness*.
3. Generally speaking we are not conscious of either of the above, and we believe in good faith (or allow this belief to persist, for those who make this illusion their business) that reality is sonorous and that it tells about itself and describes itself via sounds.

When we listen, however, to the sound of reality and when we deprive ourselves concerning this reality of any other source of information—notably visual information—we find ourselves literally in the dark: the majority of what happens and of what exists is concealed, and sound does not allow us to reconstitute it. In the first place this is because there are only sounds when something is in motion. Sound, as we have seen, is the result of an event, although we must of course add the condition that this event is a sonic one, which is not the case for all the significant phenomena that interest us as humans. For example, the manual gestures that someone uses for emphasis or to mark her intention—which refer to what she is saying—can be silent or produce a sound so weak as to be inaudible.

At the beginning of the twentieth century, the psychologist Maurice Pradines—whose work on perception deserves another look—tells the story of how the primal function of recognizing the form of the cause from sound waves was degraded or at least relativized in the course of evolution from fish to air-breathing animals (we are part of this course of evolution). The following passage is taken from his wonderfully dense writing:

> The auditory functions originate in the functions of equilibration and orientation that appear in fish to be tightly bound to the tactile function and that resemble a sort of pretactility via the liquid voice. [. . .] One of the most important adaptations that life on land necessitated must have been, for vertebrates, the result of the privation of that aquatic protection.

> [. . .] It was a matter of adapting to receive aerial vibrations—that is to say, transmitted through the air—those organs made to receive vibrations transmitted through water. Whence doubtless the prodigious complexity of the ear and the enigmatic character of its conformation. [. . .] In extending its reach by the registering of aerial vibrations, the tactile sense must have resigned itself [. . .] to the almost total loss of the sensation of form. [. . .] The voluminosity of sound, which is still confusedly felt, no longer corresponds, in any case, to any distinct representation of form or of the volume of sonorous bodies.[8]

Later, Pierre Schaeffer would clearly refute the illusion of a supposedly natural narrativity of sounds: "Does sound inform us about the universe? Hardly."[9]

In reality, we rarely have the opportunity to become conscious of this because the sounds that we hear are connected by us to our physical, emotional, and intellectual familiarity with a given context. They are connected to vision and to the voluminous representation of sonic causes, as well as to our general sensorial experience. When we visit a big city, we are struck by the general animation, by the predominant lively bustle, and we don't distinguish between what strikes us through the channel of the eyes and the channel of the ears. Rather, we create from both a single global impression. This supports the conviction that thanks to a supposedly natural solidarity, sounds reflect the images in whose company we have heard them. For example, in Las Vegas one comes across the most enormous, animated, and numerous neon signs in the world. And yet, I have noticed that the city's extraordinary visual animation is juxtaposed in fact—at street level—to a rather sparse and peaceful sound of automobile traffic. Contrary to movies and to news reports that almost inevitably paint the image with jazzy music, what you hear on the streets of Las Vegas is not the equivalent of what you see, even when the sound is, as we say, "synchronous," that is, when it has been authentically captured at the same time and the same place. Once the trip is over, the city leaves in your memory the impression of a very colorful and lively place, even with respect to its sounds, thanks to the splendor of its fountains of light. But the latter are silent, and the mute purr of the big cars that cruise the wide avenues of the Strip is inappropriate to describe them.

Therefore, if we wanted to create a cinematographic or musical symphony of Las Vegas, we would have to create sounds that would be the acoustic transposition of what one sees. For example, we could employ musical notes

in the high register (the register that symbolizes clarity and light) and very lively rhythms (a sign of dynamism). The sound would have to be a *rendering*. In the same manner, when Liszt composed his admirable "Jeux d'eau" as an evocation of the famous fountains of the Villa d'Este near Rome, his pianistic writing did not at all attempt to imitate the sound of the fountains, which—as one can hear and record on the spot—is still the same constant, indistinct, lifeless murmur. With Liszt, the scales, the trills, and the high notes thus transpose in sonorous figures not the murmuring of the spurting waters but the figures made by their flights and their falls, their division into little channels or their gathering into a global movement, their isolated scintillation or their unified mass.

Admittedly, there is sometimes a rudimentary relative isomorphism between the motion of the cause and of the cause of the sound, but this isomorphism is limited. For instance, linear phenomena can produce an apparently circular sound and vice versa. A sound produced by running the point of a pen on a piece of paper can thus very well—if you listen without looking—sound stationary and immobile. Inversely, you can create a sound that gives the impression of a circular route by writing a sinusoidal curve on a sheet of paper. Let's consider other examples of the sound-causality relationship:

- The sound of a circular saw cutting a plank: the cutting of the latter advances linearly until the moment of rupture, whereas the sound draws for the ear a sort of circular surface, so to speak, prior to the characteristic sound that precedes the breaking of the plank.
- Stirring something in a pot or frying pan by running a spoon over the bottom produces a single note. The acceleration of the motion does not trigger an increase in pitch as one might expect given the correlation of speed and pitch in other cases.

Nor is there a sonic contour that cross-checks the contours of a sound's cause. The clearest example is that of a jet plane that passes high above in the sky. The source is, as we well know, a point in the immensity of the sky that it crosses; the sound, however, is a broad and expansive rumbling that fills sonic space in a much more diffuse manner. But if there is no isomorphism, neither is there absolute heteromorphism. It is precisely these ever-varying correspondences that provide stimulation for the ergo-auditory loop (on which more shortly): a sonic motion that would be in the mold of the visual motion would be boring to produce and to listen to. We are

seduced and drawn in by way in which a sound follows without following the motions of the cause, like lovely tresses following the movements of the head they grace.

Causal vagueness forms the foundation for a poetic practice, and one that is very present in the work of Mallarmé. Take, for example, the prose poem entitled "Le nénuphar blanc [The white water lily]," where the author recounts how, daydreaming at the edge of a lake, with eyes lowered, he heard a certain sound of footsteps that he associated with the presence of a woman and that had at a given moment stopped. The poet then provides himself the pleasure of not raising his eyes at the woman who has stopped not far from him and instead of allowing his reverie the task of floating images of this presence that has been detected by sound: "Such a vague concept suffices, and will not transgress the delight imprinted with generality that permits and commands the exclusion of all faces."[10] A similar practice is followed when the Iranian poet Sohrab Sepehri, on hearing "the sound of water," asks: "What, I wonder, / are they washing in the river of loneliness?"[11] Contrary to those sounds that are marked out and identified in Victor Hugo's poem (it is Jeanne, those are the roofers, that is my robin . . .), it is not a specific person who washes something but rather "they" who wash "what"?

Causal vagueness also fuels paranoid reckonings. In the case of Kafka, it is not only because he hears the flow of water from a poorly closed tap somewhere, but also because the reason behind this flow is impossible to guess. He writes to his sister Ottla on September 2, 1917: "But above all, there's the bathroom. By my calculations someone has flipped on the light three times and let the water run for incomprehensible reasons."[12] His notation portends so many films where the plot revolves around "mysterious noises" coming from a neighboring room. Causal vagueness is in fact appropriate for dramatizing any acousmatic sound and has been put to work since Greek tragedy. A sound that comes from offstage (often from the interior of a palace) is an oft-employed effect, and we come across it on numerous occasions in Sophocles and Euripides. "I hear a noise," says the chorus in the latter's *Hippolytus*, "but I cannot say precisely what these cries from beyond the door are."[13]

Figurative Cause and Real Cause

What often prevents us from being aware of causal vagueness is the common case where the context provides information about the cause. *Identified listening* is when vision, naming, logical deduction, or any other means of

identification offers the auditor the means of recognizing—or of believing that he has recognized—the source of the sound to which he listens. It occurs when that act of listening is accompanied by nonsonic supplementary information (vision, verbal indication, familiarity with the context, etc.). *Unidentified listening* is of course the opposite (e.g., a sound given through a loudspeaker and when the source is not known to the listener; or an anonymous telephone caller). As trite as this distinction may appear, it is important to posit because figurative and causal listening are both fundamentally different depending on whether we are dealing with the one type of listening or the other. In the first instance, we project onto the sound knowledge or suppositions that come from a source other than the sound itself. I hear a footstep in the room next door; logically this can only be the person with whom I share the apartment, and I therefore hear the footstep of *that* person and visualize him or her mentally. In such instances, we are often convinced that the sound tells us all this by itself. In the second case, listening is given over to sonic indices alone and shows itself to be at once very precise in certain respects (discerning minute variations in a rubbing activity) and very imprecise in others (totally in the dark about what rubs on what).

We find ourselves much more frequently in situations of identified listening than of unidentified listening, so in ordinary circumstances we are not able to *test*, so to speak, pure causal listening. Briefly put, there are three possibilities:

1. Either the cause is visible and the sound confirms it or rather does not contradict its nature, all the while bringing to bear supplementary information about it (*identified/visualized listening*). In the case of an opaque container, for example, the sound produced when it is pierced can apprise us of whether it is empty or full.
2. The cause is invisible to an auditor but identified by the context, by knowledge, or by a logical supposition with regard to it (*identified/acousmatic listening*). Once again, it is based on this knowledge that causal listening—which rarely takes off from nothing—embroiders, as it were.
3. The cause is simultaneously neither named nor visible (*acousmatic/unidentified listening*), and the sound constitutes our sole source of information about it.

We should not delude ourselves concerning the subtlety and the possibilities of causal listening in the third case. That is, we ought not overestimate

our capacity on the basis of analysis of sound alone to arrive at precise and certain information.

Further, while it does happen that we can search in a mental dictionary of memorized sounds, this option is more limited than one might think. We might give the name "dictionary of immediately recognizable sounds"—with the understanding that such are recognizable for a given demographic—to the repertoire of sounds of which the source or source category is clearly and irrefutably identified by persons belonging to a particular community in a live context without the need to induce this identification either verbally or visually (visualized listening). Experiments with so-called blind listening where groups are exposed to unidentified sonic sequences allow us to specify a few such sounds: a drop of water, bells, footsteps, a door slamming shut. It must be clarified, however, that some of these archetypal sounds are considerably more familiar because of their constant employment in films and on television than on account of their presence in the environment of the subjects. Young television viewers in the West who write only on computer keyboards or on cell phones will easily recognize the clatter of a mechanical typewriter from a recording because it is a sound familiar from movies and crime dramas. The same goes for the mechanical ring of a telephone, the clickety clack and whistle of stream trains that are no longer in use in Europe, and of course gunshots. Having said this, if the latter are recognized in movies, it is less certain that they would be by the same people in a live context.

When we say the "sound of a voice," everyday language does not allow us to distinguish whether we are alluding to the real cause or to what is figured or represented. I propose marking this distinction with expressions that are clearly different. I will distinguish, that is, between cases where a sound *really* comes from—insofar as we can know this—a given cause and cases, which are not necessarily the same, where a sound incarnates the type of its cause and corresponds to the characteristic sonic image of the latter. For the first, I will use the genitive construction, as in "sound of a piano," "sound of a dog," "sound of a machine." For the second, I will use simple apposition of terms, as in "piano sound," "dog sound," and "machine sound."[14] The difference between apposition and the genitive preposition helps us not to confuse two cases that correspond to types that are quite independent even if they are frequently found together. The "sound of a piano" (i.e., one that comes from a piano) can be a "piano sound" (corresponding to the type associated with the piano), but it is not always so. For example, it is not so when it is a piano that is being moved or piano strings that are being scraped. Conversely, a

"piano sound" in the sense of what permits recognition can *not be* a sound of the piano. For example, it is not so when produced by a synthesizer. This simple clarification will allow us to avoid many a confusion between the real cause of a sound and its emblematic or figurative value.

On the one hand, the *real cause*—or the real causal chain—of sound is in fact the sonorous body or causal complex: the whole of bodies colliding or rubbing against one another. Or, in the case of electroacoustic music, the chain—complex and in varying degrees spread out in time—of acoustic operations and techniques that have, over the course of its production, terminated in reality in a given sound. On the other hand, the *attributed cause* is the one that, depending on context, makes a given person "recognize" the sound under particular circumstances. The attributed cause can be completely different from the real cause. Take the case of laying down sound effects: a Foley artist produces a sound by snapping twigs and at the same time shakes a blanket to produce a blowing sound; synchronized with an appropriate image, this "becomes" the sound of a huge forest fire in a movie.

The study of *causal* listening must analyze those schemata and criteria that allow us to recognize—or not—in a sound such and such cause or causal family (the sound of a living creature, of a machine, of voices, and so forth). These schemata and criteria are based on the form and matter of sound, but they are also based on the perceptual context: produced in a given place, in association with an identifying image, or with a verbal cue—in short, in a context of hetero-identification. Under no circumstances can the recognition of an attributed cause be considered as a misunderstanding in regard to the real cause or as a perceptual illusion, since it follows its own logic and rules. What I am claiming is that the "real cause" and the "attributed cause," even if they are frequently confounded, are often quite different. I am claiming further that the idea of *figurative listening* ("What does that sound represent?") is to be distinguished from causal listening ("From what is that sound really coming?"). To claim to be analyzing causal perceptions in relation to the real, historical source of a sound qua basis of these perceptions—which is what continues to be done in certain cognitivist research programs—comes to the same as studying the perception of cinematic images by wanting to concretely and completely refer such images to that which causes them in reality (variable and moving pencils of light projected onto a screen or the odd and even fields of a video) instead of taking them at the level at which they are encountered. The distinction between real causes as a function of the reality of the production of sound, on the one hand, and the cause that is

attributed, imagined, "recognized" according to context, on the other, thus permits the study of figurative listening as a realm unto itself—as something other than an inquiry into the real cause. In the same way, study of the visual recognition of forms is an entirely different matter than knowing if you can distinguish a real object from its reproduction or its imitation.

Before electricity and before the invention of recording, sonic imitation was approximate and above all instrumental, created for dramatic purposes. It did not require much to make with the help of a musical instrument or of a theatrical device thunder or wind that would be considered convincing. But we must right away add that the recording of real sounds did not do any better, and that certain natural phenomena record so poorly—or *render*, so to speak, so poorly when recorded—that they continue to be produced by sound effects or an image is required in order to make their nature identifiable. Sonic imitation is a complex issue, and coding and conventions play a large part in it. Very often something that might appear a very crude approximation in strictly acoustic terms is deemed satisfactory.

This poses the problem of what would constitute stylization with respect to sound. On the visual plane, it is possible for us to distinguish between an imitation of an object that is meant to be taken as detailed, even when clumsily rendered, and a stylized representation thereof, reduced to a few pertinent characteristics or to a symbolic pictogram. This is what enables us to recognize the sun, a house, or a person in children's drawings and to distinguish these from imitations in the manner of classical representational painting. There is nothing like this for sounds. There is no lacy, complex original, on the one hand, and a stylized copy, on the other. One can easily insert in a film sounds of footsteps that are completely simplified and reduced to ticktocks without creating an effect of outrageous stylization, whereas for images the spectator will rapidly spot whether she has to do with a simplified and stylized representation and whether the façade of the house behind the characters is represented by lack of skill, lack of means, or aesthetic desire, in the form of a graphic stylization.

There is thus no stylized sound, and the extreme simplification to which sounds are subjected in most films—simplification with respect to the original—is rarely spotted as such. The result is that almost any sound is suitable for sound-tracking an action, whereas such variability does not work for images. Thus any noise, provided that it is brief and of complex mass, is fine for sound-tracking footsteps thanks to the "synchresis" that solders the sound to the image-cause. This is not because the sound of a footstep is

somehow approximate but rather that the formal specifications that define a footstep in reality vary. People that we see walking along a street, dressed in very different ways and of different physical types, nevertheless obey common descriptive standards that are very precise. A face with three eyes or no nose, or even a body more elongated than the average (a torso twice as long as the legs) would strike us immediately as unreal or monstrous. Yet the sounds that people emit are much less precise and fluctuate much more in their particularities. Their specification sheet, so to speak, is unstable. The sound of a footstep changes constantly and completely depending not only on the shoe and the ground but also on a person's gait and pace, and so forth.

Consideration of the Causalist Schema

Give a table a sharp rap with a pen. What is the cause of the sound? Depending on what you call the cause, this question leaves itself open to a dozen or so possible responses. You can say that it is the pen, but also that it is the hand. You can say that it is the table and the pen, the one hitting against the other. Or again, the tip of the pen. You can say that the cause is the short shock or *verberation*—the vibratory wave that reaches our ears. But you can also say that it is our motion or, yet again, our desire to demonstrate something. The causalist schema as it is put forward in psychoacoustics is arbitrarily focused on the physical aspect of the signal. What counts as cause, however, is purely a question of the choice of logics in which one inscribes oneself. Take the example of Bashō's famous haiku:

> The old pond
> A frog dives
> Sound of water.[15]

The poem speaks volumes on the matter. For one thing, it disrupts the idea of the monocausality of sound: the noise is that of the water, but the poet could have just as well attributed the noise to the frog. But it is also causalism itself that he undoes. Contrary to what some translations might lead us to believe, the Japanese original indeed refrains from formulating the least causal relation—or even relation of temporal succession—between the action of the frog and the sound. To translate "when the frog dives" or "because the frog dives" are two interpretations that tie a causal knot and that falsify the spirit of the haiku. The sound in question in this classic poem can be considered, according to the perspective of the passerby, frog hunter, or artist, as

that "of the water" or that "of the frog," and on the plane of logic it is both at the same time.

Conversely, most languages maintain and endorse the myth of sound's monocausality, and the ideological and symbolic aspects of this cultural repression of the bi- or multicausality of sound should be analyzed. Even the simple formula that consists in drawing a distinction between the "resonator" (a pot) and its "source of excitation" (a spoon) as proposed in McAdams and Bigand's volume *Penser les sons* [Thinking about sounds] oversimplifies the problem.[16] *The* pot is not a homogeneous sonic body: it has a handle, a bottom, and sides. Its sonic identity—its "voice"—is attached to the note that it makes, but this note can just as well not ring out—especially if the pot is full! Significantly, Daniel J. Freed carried out an experiment in 1990 in order to determine whether auditors could identify different types of mallets of varying hardness on four different-sized pots. He concluded that it "was not possible to extract acoustic invariants as properties of the mallets." He continues: "Numerous studies remain to be done on the invariable indices that allow auditors to characterize and to recognize separately resonators and sources of excitation."[17] But this presupposes the existence of such invariable indices, and thus one is betting on the fact that there exists a category of cause in itself such as *the* pot and another category such as *the* mallet, each appearing with robotic sameness in the field of sonic indices. The experiment is thus skewed from the outset, since one has the pots and mallets make typical sounds—pot sounds and mallet sounds—without having considered the implicit conflation of sounds of a pot/pot sounds and sounds of a mallet/mallet sounds.

We can speak of sonic causalism when there is an implicit reduction of a sound to something that is fundamentally different from it. That something is the sound's cause or causes—whether the latter are its real causes, supposed or imagined causes, or else the place, circumstances, or setting of its emission, and so forth—and when this reduction is doctrinal, putting it forward as a supposed natural fact. Or yet again when this reduction is a strategic, advertising choice that allows one to sell an artistic, therapeutic, or other product. Causalism can take many forms: a scientific one when sound is grounded in the physical phenomenon that creates it; a common or everyday form, as when one speaks of natural causes; or yet again, an ecological form, as when one speaks of a "soundscape." As diverse as these may be in form and intent, these various causalisms proceed from the same misunderstanding. This misunderstanding can be calculated or not, but it is

often brought about by how we speak. The benefits that many derive from maintaining causalism are obvious: it spares us the effort of attention (in the current state of our culture, the cause, once identified, is always more easily grasped and described than is the sound). And this is an effort that society in no way valorizes, since sound is for it only an index of the cause or a vehicle for meaning, and it is not susceptible of becoming by itself a commodity. Moreover, it reassures the established schemata and, finally, permits certain entrepreneurial artists to hold us ransom to causes (along the lines of "this sound was created on a period instrument or on a state-of-the-art computer," "I recorded this in a virgin forest," and so forth). On the planes of knowledge, research, and creativity, the negative effects of causalism are numerous: the auditor, researcher, composer blunder past the diversity of sounds hidden by the unicity of what is deemed the cause (the proverbial expression "he who hears but a bell hears but a sound" is misleading). Conversely, they remain deaf to the identity of other sounds beyond the disparateness of their origins. In fact, they no longer listen to sounds except via the idea that they have formed of their cause—and therefore they listen poorly.

I call the dominant dogma that is implicit in most current discourses and in today's technical, cultural, social, and other practices *sonic naturalism*. The name fits because, according to this dogma, sound—and usually the question does not even come up—is considered as a sort of given that maintains a relationship of identity with the milieu from which it originates that implies isomorphism: the transfer onto the sound of the conditions in which it was produced; the perpetuation in the sound itself of the virtues or properties of the place where the sound was recorded, and so forth. This is most notable in the myth of the narrative spontaneity of sound, where sound is taken as recounting of itself its cause or causes, as transposing or reflecting the environment from which it issues, and where there is supposed to exist a natural or authentic acoustic state—a state in relation to which recorded sound (which tends to be called "fixed" in this regard) would be a more or less doctored or deformed trace. The naturalist position, which is the corollary of the causalist concept, is expressed in virulent form in R. Murray Schafer's celebrated study *The Soundscape: Our Sonic Environment and the Tuning of the World* (originally published in 1977 as simply *The Tuning of the World*). For so-called sonic urbanists in France and globally this work is still a point of reference for a fair number of undertakings, initiatives, and approaches. It can be made out not so much in the term "schizophonia"—which Schafer

puts forward to designate our current situation in which sound is cut off from its source and from its original context thanks to recording and/or long-distance transmission—as in his explanation of what motivated him to create this word: "I coined the term . . . intending it to be a *nervous* word. Related to schizophrenia, I wanted to convey the same sense of aberration and drama."[18] The author, who needless to say is not taking into consideration cases where a sound is produced *in order* to be recorded (LPs, cinema, video, electroacoustic music), thus seems to see in the uprooting of a sound from its birthplace recording's original sin.

If the coming to consciousness of the disjunction between sound and cause remains the founding act of the theory of the sonic object and of a general science of sound, nonetheless it does not seem that we are able to hear a sound other than as *the sound of*. And this is so even in those cases where the process of which sound is the effect—the fire of which it is the smoke, the body of which it is the shadow—has no being, does not exist or ever has. This is the case of the majority of sounds in musique concrète but also of many sounds used in cinema for a representational [*figuratif*] purpose, when they are obtained by restructuring the signal at the level of the recording medium. Concretely, a sound produced by a chain of actions to a recorded signal over time (which at the start "was" the imprint of an acoustic phenomenon, or an electric oscillation) ceases soon enough being the sound "of" its initial cause, in the double sense where it would be its consequence and its figuration.[19] This is not a problem in the case of narrative cinema: a sound, which can be the result of very complex genesis, finds, thanks to the image and to synchresis, a new anchoring in the fiction; it becomes the sound "of" Luke Skywalker's light saber, whereas it "was" an electric connection, or the sound "of" a footstep in the snow, whereas it "was" a crunching created by trampling on polystyrene beads.

But what about the case of music without image or narrative? In listening to musique concrète, there is no question or even possibility of preventing—in the name of some supposedly pure listening aesthetics—the auditor from representing to herself the *causes* of the sounds that come invisibly from the loudspeaker. You can simply suggest that she not worry about the nature of the sonic sources used—sources that, one could say, are none of her business. The composer ought moreover refrain from revealing them (except in pedagogical situations, when passing on techniques) and this in order to liberate listening *for imaginary sources*.

8))) Sound and What It Causes

REAL AND SUPPOSED EFFECTS

Constructing and Destructing

Myths attribute to sound—the sound of music and of the voice in particular—specific powers, and, first of all, the power to create or to destroy. From Yahweh uttering forth the world in Genesis to the Greek myth of Amphion, who baptizes the ramparts of Thebes by playing the flute and lyre, religions and legends often make of the voice that which causes to arise, which inaugurates, establishes, and fecundates. And they make of music an ordering, creative force. This same force may also combat, destroy, knock down the ramparts, albeit usually in the service of good, as in the biblical story of the walls of Jericho, paraphrased by Victor Hugo in a well-known poem: "And the seventh time, the walls tumbled down [À la septième fois, les murailles tombèrent]."[1] In the 1990s, an ad campaign for a certain chocolate bar with crunchy grains of rice showed malicious consumers unleashing around them a cataclysm with their bites. We see here again the myth of "sound the destroyer," just like those sometimes mythic weapons encountered in science fiction tales and espionage thrillers that are shown as fissuring matter with ultrasound or indeed infrasound. Ad campaigns and stories of the sort have familiarized even those who have not read the Bible, Greek mythology, or Hugo's poetry with this myth.

The destructive power of high-level infrasound is certainly not fictional, and weapons aimed at harnessing this power have been designed and tested—except that here it's no longer a matter of sound as such but of energy. Any thermal, mechanical, or pneumatic energy unleashed with

sufficient force will possess the same destructive power—and rather much more easily—than infrasound. If a myth has been fashioned in this regard about sound, this is because the word and what it evokes associate the abstract with the concrete and the spiritual with the material. In the case of that chocolate bar, oral aggression and the primal pleasure of biting are also very much involved. We would be the first to be deafened by the sounds and accompanying vibrations that result from chewing if listening did not entail a complex internal feedback mechanism that attenuates the sounds that we make while crunching away and prevents them from shattering our skulls via bone conduction. Something else is at stake in ancient writings and particularly in the Greek theory of "ethos," in terms of both the masculinizing, warlike, and fortifying powers of music and its feminizing, seductive, and softening powers. At the end of the nineteenth century, the symphonic or tone poem tightly interweaved these two themes.[2]

Leading Astray, Enticing, and Giving a Sign

But myths also tell us of voices that lure and lead astray (Sirens, Undines, voices hidden in waters or on the shores), of musicians who entice and seduce, who turn back, eternalize, or freeze time, who domesticate and charm bestiality (Orpheus), or who bring to ruin (the piper of Hamelin, who leads away rats and then children). In many cases, the phallic symbolism of the instrument (Tamino's magic flute and Papageno's bells in Mozart) also plays a role. Sound can also be a sign, an omen, an augur of good or evil, when it takes the form of a bird's cry or of a shock from arriving from somewhere—it rises up, rips, claws at time, punctuates a thought in midstream, rushes to encounter an event. Sound is the language of nature: something to be interpreted. It is an oracle, as at Dodona, where it speaks with the aid of an oak stirred by the wind. Sacred noises are those that are heard for themselves, those that take on an existence independent of their incidental source, those that seem to exist above and beyond, in the air. Rabelais lists a number in his *Fifth Book*: "Dodona with its ringing cauldrons, or the portico of Heptaphone in Olympia, or again the sempiternal noise of that colossus erected on the sepulcher of Memnon in Egyptian Thebes, or the din that one formerly heard in the vicinity of a sepulcher on Lipari, one of the Aeolian Isles."[3]

Acousmatic sound—that is, sound heard without seeing its source—has likewise long since been associated with myth. Whether it's Jehovah in the

burning bush or the voice of a hidden master, a topic that I have treated at length in *The Voice in Cinema*, this undomesticated sound, this sound not anchored in a spot that would enclose and confine it, is magical or troubling.[4] There is some reason to think that it symbolizes in this case the incorporeal double of the body, as "that which is looking for its place."[5] The acousmatic has a name, a theory, and an imaginary. The opposite is not the case: seeing without hearing what one should hear, which was a phenomenon that held in general with silent films. Sticking with Rabelais, when Panurge consults the Sibyl of Panzoust to find out whether he must marry and whether he will be cuckolded, he sees her light on fire half a bundle of brushwood and a branch of dried laurel: "Watched it burn in silence and saw that, burning, it made no crackling nor any noise at all [Le consydera brusler en silence et veid que, bruslant, ne faisoit grislement ne bruyt aucun]."[6] This magical phenomenon of visual isolation is presented here as diabolical. I have given it a name, taken from Greek: *athorybia*.[7]

Sound and the Balance of Forces

Sound can also be the symbol of harmony, of the balance of forces. Thus in the story of Prince Siddhartha—the future "Buddha"—who, after having sought an end to suffering in a harsh asceticism, changes his path the day that he hears a musician advising a young student. Stretch it too much, said the master, and the string breaks; stretch it too little, and it does not sound. Siddhartha at this point has his flash of enlightenment about "the middle way." The perception of a perfect interval in fact places our ears in a relation to reality. The universality of the octave relationship bears witness to a correspondence between the internal and the external that seems miraculous. Our ears are the instrument that resonates perfectly, and perhaps, if it were not for their physical limitations, would hear the harmony of the heavenly spheres, the eternal silence of which would become the supreme music—the very music of which Olivier Messiaen dreamed his entire life of hearing or hearing again, his own marvelous music being for him but an impoverished attempt to provide, so to speak, a foretaste. Sound thus simultaneously figures the limitations of our senses but also the only doorway onto the sensory transmissions we will receive at a higher stage of knowledge or of "awakening."

The mute voice, the voice of prayer, is a theme familiar to mystics as well as poets (Lamartine, for example). Not heard and not made to be heard, it is the most eloquent of all. The theme of the sound not heard always possesses the same power to fascinate: in its ecological version, it is represented by the sounds [*bruits*] that nature, it would seem, does not make to be heard relative to the scale of our everyday listening, but that we imagine as containing her secrets, which will be revealed to her patient lovers. The sound [*bruit*] of growing grass, for example, would contain the secret of grass. I have treated this theme elsewhere under the rubric of "negative noise": the idea that the silence of mountains and of other vast landscapes could be translated for us, because of our perceptual connections and our multisensorial associative reflexes, into an anti-sound of variable intensity—a dream sound all the more powerful insofar as its mute mass is gigantic.[8] Our physiological and neuronal functioning can easily explain this mental perception of negative noise, but it is pleasing to recognize its mythical value as well.

When, according to Plutarch, the Greek philosopher Anaxagoras lends to the sun's rays a subtle whistling that "makes voices more discomfiting to hear during the day" than at night, he assumes a synesthetic linkage that makes light a sound [*bruit*], just like we make sound into light and in so doing affirm a sort of cosmic vibratory unity.[9] The myth of sound as a continuum that links us via sensory perception to the imperceptible world remains to this day completely alive, and it is perpetuated by the fact that we retain—against all logic—the term "sound" to designate vibratory phenomena that are beyond auditory perception: "infrasound," "ultrasound," and even "hypersound" (waves the frequency of which is 10^9 Hz or higher; they no longer have anything to do with audibility). The idea that everything would be reducible to sound—a pseudoscientific expression of the transmutation into energy perhaps?—is the absolute form of this myth. We even come across those who would depict audible sounds as the tip of a vibratory iceberg. This tip would be the least interesting part, albeit serving to certify the rest, made up of more beautiful vibrations. Sound is in many respects mythologized as the representative of another vibratory reality that would be much loftier, of a music without sound and beyond sounds, of a voice without a voice and beyond voices. Certain fraudulent commercial enterprises that claim to use subliminal sounds "reproduced" on audio cassettes to achieve ends via consensual autosuggestion are the vulgar, venal, and degraded form of this

beautiful myth—the myth that Dante in his *Paradiso*, with examples such as the "singing wheel" in Canto X, gave its most sublime expression.[10]

Are There Sound "Effects" to Speak Of?

It is impossible to settle the matter of whether those effects—notably therapeutic or analgesic ones—that some people have long attributed to sounds or, in any case, to certain types of music and to certain low-pitched or powerful sounds are essentially "natural" (universal, tied to the human race and its psychophysiological functioning) or "cultural" (historically and/or geographically determined). Both the one side and the other are equally unprovable and impossible to gainsay, given that any experimental conditions in this domain would in themselves represent a cultural context. Furthermore, with "trance music," we never have to do with sound alone, but also with rituals, symbolic contrivances, speech, and a vast throng in which dance, music, and speech combine.[11] If one wishes to carry out experiments on sound alone, with the goal of gaining knowledge, there are of course procedures that allow for comparison with a placebo control group. Based on what I have been able to observe of the technical conditions in which such experiments on the effects of sound and on those therapies that are supposed to make use of them are currently carried out, however, the business remains fairly haphazard. That certain types of music are relaxing and that others are rousing or stressful cannot be denied, but it makes you wonder when we are told that such and such "musical selection," heard as a whole, should produce such and such effect, since we know that said selection consists in different sections of very disparate timbres, tempi, tonalities, sonorities, and so forth. It is puzzling, that is, that the experimenters or therapists appear not to inquire about what they call "the" selection, about the variables brought into play by the recording chosen, about the technical conditions of the snippet's audition, and so on.

Likewise, it is risky to pronounce that such and such a sound produces such and such effect, as if the matter of knowing what a sound is had been resolved. A more rigorous questioning would oblige us to ask: What point within the sound and what dimension of this point (pitch, intensity) produce this effect? This could be a bit better determined by introducing a certain number of variables, and also by taking into account the fact, often forgotten or neglected, that it is not "the" sound in itself that causes the effect but listening to it, and that repeatedly listening to a sound in a laboratory is a source

of effects linked to the repetition itself. Now, in cases where these effects—revitalizing, calming, delightful, or disturbing—seem sufficiently proven, it is pointless to place them at all costs on a plane where they do not belong. Drinking two glasses of wine—even bad wine—on an empty stomach has a much greater momentary effect on the body and mind than listening to a sound. When music puts us on a certain spiritual plane, what is at work is doubtless a harmonization of movements and forms, but it is doubtless not, or at best partially, the sound itself in its physical materiality—since this sound is transmitted in very different ways to one person or to another depending on one's position in the hall (if we are talking about a concert) or on the reproduction equipment used (speakers, transistor radio, hi-fi system, etc.). Yet it is not surprising that sound, erstwhile vehicle of language, should be invested in—nostalgically—as a site of effects in which language, in its meaningful dimension at least, isn't at stake. *Sound becomes the symbol of that which—in a mythologizing a posteriori reconstruction—has been sundered, broken, and lost in the accession to language*, and listening to sound as such—and no longer to language—often symbolizes regression and rejoining that unity.

The Circle of Energy

The result of a movement, itself the image of a movement—and provoking in the auditor a desire to move—sound is associated with the idea of endless motion, of an energy circle. But let's look at where this circle is broken: if sound expresses a movement, this is not—or not only—the movement of its production. An ascending scale is not necessarily produced by making one's hand "go up," and a back-and-forth movement, as a bow on a string, can create a continuous sound that gives the impression of going in a single direction. The notion of generative sound is so ingrained that we are surprised to read in Alfred Döblin's short essay *Gespräche mit Kalypso* [Conversations with Calypso]: "On the one hand, there is sound, and on the other, the thing that sounds. [. . .] But how are sounds related to things? Things move and press against one another, and from this sound arises—and yet, it does not move: stillborn, the product of the wedding of the living. It changes nothing. It is impotent. Air makes the mill go around; sound does nothing."[12] This remark takes the opposing view of the myth of sound's effects, the myth of perpetual motion in which sound, produced by a movement, leads in turn to another sound. At the same time, it sheds light on this myth by the very fact

that the writer concretely puts to himself the question and sees in it something astonishing. Why does sound, he wonders, not have an effect? Why doesn't it convulse? But also: Why should it? The question is as important as the answer, also negative, that he is given. Sound would thus be the figure of an energy that seems to convey possibilities—the image of that energy without having its physical properties. It breaks and extends at the same time the circle of causes and effects. We expect, in effect, it to retransmit that energy into us, and thus for the cycle to continue. And that's true. But when, for example, we dance to a piece of music, we pay with our own physical strength to express and to expend that communicated energy. We have to "get across." Must we stop, as Döblin seems to do, at the dissipation of energy that takes place in the process? Sound in that case is not energy in itself but the intermediary of energy.

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PART IV • sound transformed

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9))) How Technology Has Changed Sound

A Lost World

One of the oldest recorded sounds that you can hear today is the voice of Gustave Eiffel, architect of the eponymous tower, which was captured at the end of the nineteenth century on a phonographic cylinder. He is reciting a poem. As is often the case with these old documents—but perhaps it was just to make himself adequately heard by the machine—his speaking voice is high-pitched, his articulation is perfect, and you can almost make out everything in spite of the background noise and the age of the recording. As for the poem that he is declaiming, it celebrates the martyrdom of a beautiful acacia, sacrificed for firewood—a martyrdom where nobly the tree let fall, before being chopped down, "a shower of flowers for each blow of the ax." Could this be a symbol, at the threshold of the history of recording, of sound separated from its source? Notwithstanding, we are moved when Eiffel, from the top of his tower, where this reading is taking place, dates the document with his still high-pitched voice, after a brief pause, henceforth sealing it with the words "the eleventh of February, 1891."[1] There is a good possibility that what we have here are the oldest sounds of speech to have been preserved up until today. To my knowledge, the two legendary recordings—legendary in both senses of the word—of Edison (reciting "Mary Had a Little Lamb") and of Charles Cros (supposed to have said "Shit!"), which were made some thirteen or fourteen years prior, have been lost.

As for the remainder, we have to accept the notion that all other sounds emitted before this have vanished. Some do live on in books or in music. But, needless to say, before we treat literature as "bearing witness" to past sounds,

we must account for properly literary platitudes and traditions. When R. Murray Schafer in *The Soundscape* undertakes a review of the sounds of the past, he does so with the help of texts that he, along with his students, has collected. Yet the sounds that he invokes first and foremost are not necessarily those that were heard most often in centuries past; they are topoi, commonplaces of poetry. If Schafer tells us of pastoral sounds by citing Virgil, this is because the Latin writer speaks poetically of the buzzing of bees and the cooing of ringdoves rather than of carts and ax blows. And if he speaks of such things, it is because in his day such cooing and buzzing were already poetic motifs in his models, Theocritus and other Greek bucolic poets. We should not be surprised, then, if the categories of human sounds prior to the advent of recording and laid out in Schafer's work are the same as those present in literature and music: pastoral sounds, the horn of the mail coach, sounds of the farm, of war, bells, clocks, mills, windmills, and forges—all sounds already "musical" in their era, having been imitated or evoked by music, and already poetical for having been poetic commonplaces.

Moreover, Schafer is quite clear on this point when he writes: "We will not expect to find striking confessions concerning the sounds of candles or of torches among the ancients any more than we find elaborate descriptions among the moderns of the 50- or 60-cycle hum," for such sounds "are rarely listened to consciously by those who live among them."[2] I think that a vicious circle of a cultural sort is also at stake here: sounds that are not marked, not emphasized by language, art, or culture—today it is cinema that makes them into stars or not—are often forgotten, regardless of whether figure or ground. In another work, I have already described how, thanks to a curious and novel scotomization, recording devices from the beginning of the twentieth century retained not a single sonic trace of the world other than recordings of music and of speech.[3] The acoustic world of the time—the world of vehicles and machines—was neglected. It was, however, during this same era of the end of the nineteenth and first couple of decades or so of the twentieth century that the sounds of horse-drawn carriages coexisted with—added little by little—trams, steam trains, subways, and automobiles, which would have perhaps granted the "urban symphony" an ideal acoustic variety (the combination of discontinuous and continuous sounds) that it has since lost. In the old days probably consisting primarily of discontinuous sounds, as Schafer astutely deduces, today it is mainly a continuous stream.

If there is one certainty in what we can trace in the history of sound, it is that a throng of technological innovations appeared—or rather were

catalyzed—in the last decades of the nineteenth century: the transmission of sound at a distance, along with the recording and amplification of sounds. Although foretold, imagined, and prepared for decades, these shook up the situation so definitively and so quickly that the effects of the technological innovations of radio, telephone, recording, and electroacoustic instruments, which are in my opinion exceedingly distinct from one another, were confused. Imagine that television and cinema had been invented and above all developed at exactly the same time, which was the case for wireless and telephone (transmission) and sound recording (technologies of fixation), which practically appeared together. I would take bets that cinema would in this case have been considered as a secondary and derivative form of television.

The Seven Basic Technological Effects

I propose to mark off seven effects enabled by the machines that came on the scene starting at the end of the nineteenth century and that disrupted the production, nature, audition, and diffusion of sounds and music most of all—but not just music. These effects, essentially independent, are often confused with one another because of their more or less simultaneous appearance and because certain devices stack them up and permit their simultaneous use, but also because certain of them have not yet been pinned down in their specificity.

1. *Capture*. This is the first of the seven basic effects of technology on sounds. It consists in, by the intermediary of one or several microphones, converting a part—always and necessarily a part—of a so-called sound vibration, which is by definition ephemeral and complex, into something else that can be immediately retransmitted at a distance by taking the form of an electric oscillation or can be fixed on a medium. In this conversion many of the properties of the original signal are obviously lost, or rather, they do not get through. Usually—but not always—enough are left over to transmit something and have it identified. Stereophony and later quadraphony and "multitracking" technologies arrived and along with them the temptation to carry out capture "in relief." Let us just say that the difficulties involved in multisound recording and above all playback are terribly complex, that we have yet to master them, and that, regarding the specific area of orchestral music, we are today still very far

from being able to restore in the playback of a sound what would be spatiality and volume in a visual object.

2. *Telephony*. This includes the telephone, obviously, as well as radio, and is the retransmission of sounds at a distance. As such, it is distinct from *phonofixation* (see below), with which it is often confused. The latter, termed "recording," has often culturally and ideologically been presented as a differed retransmission of an uninterrupted event. Whence the repugnance, so well analyzed by the great pianist, composer, writer, and producer Glenn Gould (particularly in his 1966 article "The Prospects of Recording"), of so many music buffs when confronted with the notion that the majority of recordings of classical music, imagined as documents recorded in one take, are in fact edited in the studio.[4] Indeed, they want to know nothing about this. On the topic, wireless was for a long time—just as television later—during its initial years essentially based on live retransmission, and very little recorded music was broadcast via the medium.
3. *Systematic acousmatization*. Acousmatic situations, where one hears without seeing, were certainly not new when telephone and radio were invented. You find them in an array of daily circumstances: noises from the street or from neighbors, sounds at nighttime, and so forth. It is just that the radio, telephone, and recording systemized the acousmatic situation and provided it with a new meaning by dint of insinuating it automatically and mechanically. The acousmatic is supposed to allow one to attend to sound in itself because the cause is occulted. Schaeffer speaks of it in this way. But we must admit that in many instances, it is just as capable of leading in the opposite direction: because they do not see the source, auditors become all the more obsessed with wondering, "What was that?" In fact, the acousmatic situation cuts both ways: sometimes it helps us attend to sound itself; and sometimes, on the contrary, it results in the idea of the cause taking hold of us, haunting us, and monopolizing our attention. It is really rather the principle of the repeatability of fixed sound that allows us to make it into an object and to study it.
4. *Amplification and deamplification*. In this case we are concerned with a modification of the intensity of a fixed sound (phonofixation) or of a retransmitted sound (telephony) on the occasion of its audition. In the early days of sound recording, the sound reproduced was generally speaking smaller than life, especially with the voices of singers

or the sounds of an orchestra. And this was true even if, in certain instances, amplification systems—pneumatic ones in particular—already existed. Starting in the 1920s, with electric amplification, it became easier to enlarge it. Notwithstanding, when we listen to a recorded orchestra, it is almost always a reduced sound to which we listen—one that bears no relation to the full volume of the sound when a "live" orchestra is in front of us. Actually, amplification justifies its name, which can sometimes be deceiving, not because it amplifies the source sound but rather an electronic signal. Scaled-down sound is thus a new and specific phenomenon produced by mechanical means of sound recording (prior to electronic recording), but also today and to a lesser extent by the telephone along with certain listening devices (portable audio players).

5. *Phonofixation*. This is the fifth of the seven basic technological effects and in everyday speech is called "recording." The term covers any process that consists not only in "fixing" existing sounds (concerts, personal or historical events, etc.) but also in producing, in a studio session, sounds specifically intended for inscription onto the medium. It took about seventy years—from 1877, the year of the phonograph's invention, until 1948—for phonofixation to bring us to the creation of a type of music conceived on the very principle of fixation. This was thanks to Pierre Schaeffer, and he baptized his creation musique concrète. In the meantime, the fixation of sound was put to use for the diffusion of existing music on records and in cinema within the context of narrative and with narrative aims.

One might wonder why I use the term "fixation" rather than "recording." Back in 1990, I put forward the term "fixed sounds" in preference to "recorded sounds," which stresses a supposed sonic reality that would exist prior to its fixation, to designate sounds stabilized and inscribed in their concrete details on whatever recording medium, whatever their origins may have been, and by whatever means obtained.[5] Of course, what is fixed is under no circumstances the faithful and exhaustive account of what characterized the sound wave emitted at the time of fixation, except when—and this is a significant exception—we are talking about a synthesized sound, which only exists thanks to the very principle of electronic generation (i.e., without initial verberation) and for which there cannot be any difference between its first emission and its fixation. Moreover, when, thanks to the copies and deferrals that

it allows, fixation colludes with operations of signal processing (see below), it becomes an entirely separate creative process.

As will have become clear, the term "fixed" insists on the positive and specific effects of the phenomenon, and it encourages us not to take a fixed sound for nothing but a trace, by definition incomplete, of something that has fled—which it surely is if we are talking about recordings of opera productions or of great voices, but not when we are talking about creative endeavors such as sound cinema, radio art, or musique concrète, which are grounded in phonofixation itself. In the exact same way, moreover, many recordings of rock, pop, and jazz are conceived and constructed *for* and *on* the medium. More radically, fixation has enabled the re-creation of a sound by turning it into a repeatable, specific, novel, and observable object that is at the same time totally different from the captured event. Yet this revolution continues to be thrust into obscurity by the ongoing investment in notions of recording and of "fidelity," as well as by likening recording to a simple mode of deferred sound transmission.

The term "recorded" puts the accent on the cause, the origin, and the moment that such and such sound would have aerially occurred and of which the medium would provide us with only an incomplete and deceptive imprint. With the word "fixed," on the contrary, applied to the same technology, this accent is displaced to the fact that a feature, a sketch, an object is constituted that exists in itself. "Fixed" affirms that what counts—the sole reality henceforth—is the sonic trace, which is no longer only a trace but a veritable object, stabilized with regard to its smallest sensible characteristics, including fleeting ones—precisely the ones that we can control only by means of fixation. From this follows: acoulogy is impossible without phonofixation, which for its part cannot be the "faithful" reproduction and renewal of everyday sonic reality (as if the objects of nature could only be observed via paintings, drawings, photographs, films, and so forth . . .). And this constitutes both the specificity and the "uncertainty principle" of acoulogy.

For several decades, systems of sound recording had as one of their characteristics the need to work at relatively exact recording and reading speeds in order to match not only the length of a given sound but also its pitch. It was impossible to accelerate or to slow down the sound without raising or lowering it, which, moreover, became much used tricks of the sound trade, used in animations, in fantasy and science fiction films, for the creation of sonic novelties, and so forth. There was an obligatory acoustic link between

a sound's spectrum and duration, and, naturally, the race was on to build a miracle machine that would permit the decoupling of these two aspects—in concrete terms, to transpose a sound either in the direction of the high range or of the low while retaining the same duration, or, inversely, to contract or dilate a sound's duration without it becoming more high-pitched or low-pitched. Starting in the 1960s, using a complex and ingenious system of spinning magnetic heads, the device known as a *Zeitregler*, or "temporal regulator," manufactured by the Springer company, more or less achieved the desired result.[6] The "harmonizer" of the 1970s could transpose the pitch of a voice without changing its duration or flow, but it conferred a distinctive electronic timbre. Today computers enable us to achieve this decoupling more and more cleanly, but it's precisely then that we notice that certain features of a sound—particularly features of substance—are tightly linked to duration and that *if it's possible to transpose a melody, it's not so easy to transpose a sound*.

In the majority of cases, the recording of sounds respects more or less their original duration. It follows that phonography is inevitably chronography, which is not necessarily the case with cinematography, that is, the recording of visual movements. The latter allows one to isolate the speed factor and to slow down a visible phenomenon without altering its proportions, outlines, color, and so forth. This is why in silent cinema, movement could be fixed and reproduced with relatively wide margins of variation in the speed of filming and of projection. These margins could then be used for expressive or dramatic ends (chase scenes, breaking down a movement, dream sequences or drunken sequences, etc.). Silent cinema thus in no wise recorded the duration of phenomena. It required the advent of the "talkies" to couple cinematography to chronography—a historical fact that has gone oddly unnoticed. With today's video cameras, which forbid gradual variations in filming speed, an amateur no longer has a choice with regard to speed, and to regain such flexibility requires a detour through a control room or a computer.

It remains that phonofixation made sound into the sole component—or a fundamental component—in the new art forms that appeared in the course of the twentieth century and that might be labeled chronographic. Those arts that we might call "chronographic" are those, such as sound cinema, videotape with a single audio track, or musique concrète, that work on time fixed to a precise speed. All of this must be considered in relative terms: for one thing, cinematographic projection, in those instances where it is still in

use, entails a certain degree of flutter (oscillation in speed, more noticeable with regard to the sound than the image and endemic with older projectors and film editing tables); projection is also sometimes slightly sped up for television broadcasting (in France the shift is from twenty-four to twenty-five frames per second), which makes the movements faster, raises voices a bit, and shortens the film.

There are differences between listening in situ and listening to a recording. As Abraham Moles brilliantly put it:

> With visual perception, the eye goes where it wants, on a rapid journey the movements of which we have only just begun to analyze. As for the soundscape, it is imposed on us via a sequential system: its distinctive components are stuck in a specific order onto the length of the track, and we can do nothing about this—we are subject to this order—and the advent of new components entails the loss of old ones that can but shine for a brief moment in the phosphorescence of our working memory. On account of this, our ability to hierarchize such memory is affected.[7]

What Moles says here is correct in part, but it only applies—and he does not make this clear—if there is no possibility of listening again. That is, it applies to in situ, to live, listening. Yet it is not often during such in situ listening (that is to say, under circumstances where an original acoustic sound wave is produced) that the set of components heard by the subject constitute, as he says, a sonic landscape, or, to be precise, where they constitute a totality in which the set of components, of near and far sounds, of local figures and global ground, might still constitute a tableau. Here again, an implicit naturalism subsists in the formulation.

This naturalist assumption will be found, as we shall see, in the majority of conceptual descriptions of auditory objects, and what almost all have in common—paradoxically—is that they were put forward in an era when one could then study sounds via recording and not on the spot. When, for example, R. Murray Schafer speaks of "soundfacts" and of "soundscapes," he does not specify that what is at stake is hearing in situ, at the very moment, under circumstances suited to this type of audition. These are as follows:

- The unique and ephemeral character of perception
- The influence of the global sensorial and material context that identifies a given sound and that provides it with a particular meaning and effect (notably via visu-audition; see chapter 10)

- The impossibility of apprehending simultaneously the different, proximate and distant sonic planes in a single, fleeting act of listening

Or, if we are talking about what can be perceived from a recording, which affects sound as follows:

- It decontextualizes sound, in particular by making it "acousmatic."
- By making an object repeatable, the perception of which can be formed and rendered precise because of the "depositing" of successive, memorized impressions (as long as the auditor is granted access to the repeatability of a sound, which is not the case with a film spectator in a cinema or with someone listening to the radio).
- By constituting as a composed tableau that which in situ is but a sequence of events that the ear pecks at more or less haphazardly.

These two listening positions—the "in situ" and the "via recording"—are thus fundamentally different, and they condition perception in likewise different ways. The concepts cited above presuppose fixation, but they implicitly lower it to the level of "study method" and "lab report." But it is something else entirely: it is the very condition of the study of sound, but a condition that changes sound's very essence. In situ listening is characterized by a selection—be it reflexive or conscious—of relevant components and the repression of others, which remain unconsciously "heard." Without this repression, moreover, the subject would be so absorbed in the complex and multispatial sound ensemble making demands on him or her that he or she would be obliged to suspend every other activity save listening.

6. *Phonogeneration*. This is the sixth of the seven basic technological effects. It consists in the possibility of creating sounds ex nihilo with loudspeakers and electronic procedures: electronic musical instruments using vacuum tubes at the beginning of the twentieth century, generators in the 1950s, synthesizers in the 1960s and 1970s, computers, and so forth. Much was expected of these electrical generation devices. They were dreamed of as the means to create an entirely new sound world, and one subject to mastery at will, potentially infinite, and virgin with respect to any causal taint—and subsequently, they became the objects of a little too much scorn.

Actually, on the one hand—and this rule holds as well for "digital" sound, the subject of a passing fantasy that sound might be 100 percent purified

of any cause—every sound whatsoever counterprojects, one might say, the consciousness and representation of a cause, of which said sound would be but the emanation or shadow evoked in every instance of figurative listening and that may have nothing to do with its real cause. On the other hand, new systems for phonogeneration and synthesizer programs are constantly being produced, and each has its characteristic color, such that the auditor, even if not a connoisseur and not necessarily in a position to ascertain—as some can—from which synthesizer or which program the sound is coming, will discern readily enough if the sound dates from the 1960s, 1970s, 1980s, and so on. And we can hardly hope that synthetic sound will attain a sort of "perfection" and flexibility that will mean that it can no longer be dated. In fact, because of the evolution of technologies and procedures, synthetic sounds find themselves swallowed up on a regular basis, and you can just as easily state, "That's the sound of Korg synthesizer from the 1970s" or "That's a Moog," as, "That's a harpsichord."

The first electronic instruments were often conceived of as a mixture of organ and violin, combining the capacity for infinite duration of the former and the possibility for gradual slides in pitch of the latter. They certainly did not bring into being as much of the as-yet-unheard as one might have expected. Not only had simple transformations of acoustic sounds fixed and then reshaped already opened up many possibilities that these instruments simply extended, but the traditional Western orchestra had, using increasingly ingenious techniques, already, if not saturated the field of musical sounds, at least enlarged it considerably. Do you want uninterrupted sounds? The organ and bowed instruments—and even wind instruments when they successively link to hold a single note—have long since provided them. In a certain respect, as we shall see, what was left to electronic sounds was the domain of pure sounds, those without accidental features and lacking in harmonics. Their design also opened up for exploration the field of acoustic decouplings.

7. *Reshaping* is the seventh of the basic technological effects on sound. Often called processing or manipulation, it consists in any action (slowing down, playing backward, etc.) that reshapes in a significant way any given transmitted or fixed sound starting with the signal inscribed onto the medium or electronically transmitted and ending up with another fixed or transmitted sound. If the situation is one of fixation, the chain of reshapings is needless to say infinite: any fixed

sound is subject to becoming via reshaping the source of another fixed sound and so on. By dint of the causal divide theorized by Pierre Schaeffer, we cannot say that within such a chain there is an original sound that would be the "natural" seed of subsequent stages. Every sound produced by reshaping another must be considered a new sound, and expressions such as "rigging" or "enhancing" a sound thus strike me as inapt.

Consequences of the Basic Technological Effects

From Edison's cylinder in 1877 to computer memory capacities circa 2010, there is to be sure, over those 130-odd years, a quantitative linear progression of fixed and diffused sounds (increase in the high range, in the low range, in the number of tracks, in contrasts of power, etc.), but it remains to be seen whether this represents an increase in "fidelity"—a notion ideologically and aesthetically as risky as would be the notion of a faithfulness in the photographic image to the visible of which it provides us with a representation. In reality, the term "high fidelity" is taken up from the rhetoric of advertising. Actually, a sound said to be reproduced or recorded entails innumerable differences with regard to the original verberation. The most notable of these take place at the levels of spectral equilibrium, of space, of texture, and of dynamics (contrasts in intensity, which are by definition compressed and "clipped" in recordings). What gets called "fidelity" would be better termed "definition," and it resides in a certain number of quantitative increases, but also in the presence of details that are often, at the time of recording, produced by the proximity of sound source and microphones—details that are, moreover, inaudible to the auditor in a classic concert situation. As Glenn Gould has nicely analyzed: "Recording has developed its own conventions, which do not always conform to those traditions that derive from the acoustical limitations of the concert hall. We have, for instance, come to [. . .] insist that a searching spotlight trace the filigreed path of a solo cello in concerto playing."[8] The definition of a sound heard via a loudspeaker is notably proportional to its *bandwidth* (larger if you head up into the high-frequency range or down into the low range), to its *dynamics* (richness and extension of possible contrasts in intensity, from the most tenuous to the most powerful), and to its *spatial spread* (two tracks or more, allowing the sound to be distributed in space and thus for a more distinct perception of a number of details).

Understood in this way, the definition of recordings has certainly increased considerably since 1877, but not necessarily or linearly their "fidelity," and what it means to reproduce a sound is still up for debate. Certainly, at a given moment, this or that sound recording system seems to give us the real sound, and it takes the appearance of another system for the previous one to show its limitations. What is said today about the fidelity of current recordings was already expressed with the same sincerity in the 1930s with respect to recordings or to films concerning which it now appears obvious to us that they are nothing but distant glints of the sounds in situ. We have doubtless conflated the feeling of presence (e.g., the feeling that many recordings provide of being "close to the harpsichord"—indeed, inside its sound box—or close to the viola da gamba) and fidelity (whereas it is very rare that you hear a harpsichord like this in concert). What has made it possible to achieve this impression is the way in which—by recording from a proximate position and with a larger bandwidth in the high register—the sound of a voice or an instrument is treated like a surface seen from close up and under low-angled lighting, which throws into relief textural details. What follows from this is a feeling of hyperrealism, particularly with regard to the higher frequencies, that achieves an effect of perceptual liveliness, of aural attention and instantaneous reaction, and that gives the impression of extreme presence.[9]

Certainly, as far as bandwidth goes, there have for a while now been recording and playback systems that allow one to cover the entire range of frequencies audible to the human ear (and even beyond, but that beyond does not concern us). This does not mean, however, that the matter has been mastered. In effect, to be faithful to the sonic richness of a natural acoustic phenomenon, it does not suffice to make heard everything from the extremities of bass to those of the high-pitched register; one must also ensure that these frequencies are distributed with a balance in conformity with what the human ear hears in situ. Yet, as audiophile experts know, this balance is rarely found, and if attained, it is not necessarily by using the most up-to-date systems, in which the recorded high-pitched frequencies are much harsher than in reality. If you are in doubt about this, just think about those fine and clear sounds that are produced, for instance, by the chiming of crystal glass or metal cutlery, or again, the rustling of a carpet of fallen leaves when stepped on or, indeed, the crunching of footsteps in the snow. It is incredibly rare for the delicate balance of these sounds as we perceive them in situ to be recovered in the recordings made of them, and the same goes for even the most accomplished sound effects. In general, the sound that you

hear from a loudspeaker, whether taken from reality or created, is either too dry and piercing or insufficiently distinct and finely drawn.

As for intensity, given the enormous variations in sound level observed in the natural environment and the extremely broad palette of contrasts that we are capable of hearing, it is completely impossible to reproduce these on a recording. And if it were possible, it wouldn't be done. Even digital sound does not voluntarily employ the entire dynamic palette at its disposal and is but a pale reduction of what occurs in situ. This is so because such recordings are intended to be heard and broadcast in the usual contexts: rarely soundproofed apartments, outdoors (for which suitable portable audio devices evolved), for the driver of an automobile or motorbike, and so forth. If one etched onto such recordings veritable *pianissimi*, they would be masked by ambient noise or the user would feel constrained to raise the listening level of his or her device only to subsequently bear the full brunt of the *forte* laid down in the score. Likewise, the user at home would need to constantly intervene to equilibrate the listening level in relation to the environment, to his or her position in relation to the speakers, in relation to the disturbance that it might create for the neighbors, and so forth. This explains why even the striking sonic contrasts that digital recording allows are rarely fully used. In popular music, the practice has even been pushed in the direction of a paradoxical and frankly crazy use of compression and leveling of intensities, just when the means have become available to make heard marked contrasts. At a concert, we can mentally prepare ourselves for a brutal attack since we anticipate events by watching the orchestra and conductor. Further, we know that the variations in intensity will be kept within parameters determined by the physical limitation of the instruments. In front of or beside a loudspeaker, we do not know what might come out, and we are ready for anything.

Other and various "unheard of" effects come about as a consequence of the basic technological effects. Moreover, we can say that they are "unheard of" in two ways: on the one hand, they create effects until now historically impossible; on the other, they have remained for the most part unperceived as such and have little by little passed themselves off as normal, whereas they were much more novel and significant than other, more conspicuous bruitist effects. One of these "unheard of" effects is that of the *acoustic isolate*, which relates to the fact that a retransmitted sonic occurrence is isolated—by fixation, by amplification or deamplification of the sound, by acousmatization, and so forth—from the circumstances and feelings with which it

was at the outset associated. For example, the sound of a train listened to via loudspeaker, even if the recording and reproduction are "high definition," becomes an acoustic isolate in relation to the feelings experienced in a train, where these sounds are associated with not only visual sensations but also *phoric* sensations (the feeling of being carried and jostled, which goes back to life in the womb). Or, to take another and simpler example, a common sound may find itself detached from the sight of its cause. Furthermore, an audible isolate can partially awaken in the body of the auditor, thanks to conditioned reflexes, feelings that were originally global. The "acousmatization" that is the fact, by definition, of media such as radio and telephone, but also with modes of expression such as audio drama and musique concrète, produces specific acoustic-isolate effects, where a given sound is detached from the thermal, tactile, and visual sensations that were formerly most commonly associated with it. The acoustic isolate is only a particular instance of what we might call *single-sensory extraction*. I use this term to name the technological process by virtue of which visual or sonic recording or replaying machines artificially isolate various types of sensations (gustatory, acoustic, etc.) that were formerly clustered together around objects. Needless to say, this concept only aims to describe a phenomenon made very common by machines. It does not aim to judge or even less to condemn it (in the name of a principled preference for naturally occurring facts).

Something that I call *acoustic decoupling* is another effect—often unintentionally produced—enabled by sound technologies of capture, fixation, amplification, phonogeneration, reshaping, and so forth, when these technologies lead to isolating and causing to vary separately from one another aspects of sound that were formerly necessarily correlated. For example, we can manipulate the intensity of a sound without simultaneously changing its timbre, which formerly would have automatically changed. Here are some other examples: in the nontechnological acoustic world, a sound that becomes more distant changes simultaneously in harmonic timbre and intensity, a sound that strongly rings out is colored by a certain reverberation, diminishing the intensity of a note on the piano entails a gradual impoverishment of the harmonic spectrum, and so forth. But the acoustic decoupling that machines produce allows for the isolation of these variables, giving birth to sounds that have literally been hitherto "unheard of" before the technological era. "Unheard of" not in the sense of "bizarre" but rather insofar as they contradict previously unavoidable acoustic laws. For example, the long fading chord that ends the Beatles' song "A Day in the

Life" from *Sergeant Pepper's* and where the harmonic spectrum is not impoverished as the intensity falls is a good example of, so to speak, antinatural acoustic decoupling.

The coupling of aspects of sounds as they unfold can in effect be called "natural," in the sense that it is logical and explicable, but not in the sense of representing a categorical imperative to be respected. The nonnatural is for humans not necessarily an act of aggression. What else is culture? Nonetheless, certain acoustic couplings are so ingrained in us that to undo them inevitably produces an effect in relation to these conditionings themselves—an effect that will be inexorably lost when the day comes that the auditor will only be familiar with certain sounds within the framework of recordings, films, and so on, and will no longer have the acoustic point of reference. This has already happened for many music lovers with regard to traditional orchestral instruments. Well before the advent of modern machines, instrumental music doubtless never deprived itself of working at decoupling acoustic aspects (variations in pitch alone, variations in intensity alone, etc.), knowing that sounds where one aspect at a time varies can seem at times more impoverished and dull. And why not, since in certain cases this can create an expressive and aesthetic effect? As an orchestrator, Tchaikovsky, for example, worked at the "decoupling" of habitual effects. With him, heading up into the high register might not be accompanied by a crescendo, a *tutti* might have a dull tonality, and so forth.[10] Likewise, in many cases, opera, recital, and variety singers strive to isolate vocal variables and to decouple them in order to produce particular local effects. Nothing is more elegant, for instance, in a piece of choral music, than a high note sung piano, whereas the "natural," spontaneous coupling would consist in associating the rise in pitch with an increase in intensity.

The difference with machines and particularly with synthesizers is that the latter can automatically and systematically carry out such decouplings, giving birth to what might be called an aesthetics of "impoverished sound." The poverty with which many synthesized sounds are reproached—and not just those coming from "low-end" equipment—often comes from the fact that few parameters are varied. For example, only the pitch might change, whereas between a note played on an acoustic instrument and the next note either higher or lower in pitch, a bunch of variables come into play (intensity gradient, harmonic timbre, vibrato, etc.) concurrently with pitch, even if they change more discreetly than the latter. At the same time, this poverty constitutes the charm proper of synthesized sounds, and pop groups and

artists such as Kraftwerk and Brian Eno figured out how to convert this into an aesthetic, just as in the visual domain some figured out how to make an aesthetic out of the poverty of the first video images. Poverty is thus not necessarily unaesthetic. This in turn raises the matter of understanding why an artificial sound might be labeled ugly. Some have attributed the unattractiveness of modern telephone rings, since the shift to electronic rather than mechanical ones, to the fact that these sounds do not have much in the way of harmonics and are not, as we say, "timbred." But if we think aesthetics is more a qualitative matter than a quantitative one—that it is thus more about the balance than about the richness of a sound—we will say that the synthetic rings of telephone handsets from the early 1990s owe what might be considered as their ugliness to a distinct lack of balance between their melodic complexity and their material poverty rather than to the latter alone. This notion of balance explains why it is that in films from the 1930s certain sounds with a fairly impoverished spectrum should nevertheless be so beautiful: because there is precision and harmony, as much in their acoustic realization as in how they are put to use.

It is tempting to regard the sonic environment as an ecosystem, as is often done today. The events in such a system would then be the appearance or disappearance of sonic beings, just as for living species. The recent novelty in our world has been the teeming emergence, dating some years now, of watches, cash registers, video games, pagers, vending machine keypads, crossing signals, travel clocks, and various other gadgets that emit high-pitched electronic beeps that strike the ear in the range that hitherto had been entirely reserved for the appeals of certain tiny creatures. Since these novel, 100 percent synthetic chirps have appeared in the urban sound jungle, perching high up in order to make themselves heard above the din, something has changed in our apprehension of the modern world. This world now speaks in ways that once only nature did and the once-free space of the medium-high and very high frequencies is approaching overpopulation.

Another novelty associated with this phenomenon is that increasingly the sounds of the devices in our surroundings are no longer mechanical or pneumatic, and they no longer follow directly from the functioning of these devices. Rather, they are added on as such, electronically, in order to help us better follow our transactions or perceive our silent gestures, as when we tap in a personal identification number on a keypad at an ATM and a beep confirms that we have indeed pushed the key. These are not sounds [*bruits*] in the sense the word once had but sound effects [*bruitage*], sonic punctua-

tion or ergo-auditory confirmation. The old partition of sounds in the world into *intentional* ones (language, calls, music, codes) and *nonintentional* ones (epiphenomenal sounds of things and objects) can no longer be made as before—and this without including that already machines are starting to appropriate in a synthesized form our ancient privilege: the human voice. We thus live in the world according to Beep—an anarchic world, where each individual, with his or her personal gadgets, is a potential carrier of beeps and telephonic sounds that ring in the same manner regardless of various functions.

Other effects enabled by modern technologies have changed how we live with sounds, while at the same time becoming expressive means in music and film. Consider, for example, the instantaneous and widespread use of leaps in the qualitative aspects or intensity of a sound made possible by editing. Orchestral music sometimes made use of these but did not allow for too many (Haydn's "Surprise" symphony [no. 94 in G major] is an example) and had to have recourse to an entire strategy to produce them. Today, instantaneous sonic commutation from one state to another, from one intensity to another, takes place constantly, as for example when one "zaps" through television channels with a remote control device. New technologies also allow us to transport a sound world via a car radio or in our heads (portable audio devices, headphones), and we employ them like a mask. They permit a space to be soaked in an exclusive musical sound or with sales patter, whether in a department store, commercial street, or Chinese rice paddy. Such sounds do not change a bit in volume or presence for the person moving about within the space. Further, these technologies provide the possibility of having control over powerful sounds without giving of oneself, by simply turning the knob of a potentiometer. Finally, in some cases, they bring about a relative loss of scale with regard to listening to sounds.

On this last point we might give ourselves permission to forward some critiques about sound as it currently stands and consider how we might compensate for—and indeed combat—certain effects, not on the principle and with the only pretext being that the situation is unnatural, but because the effects in question can diminish and distort human communication and listening. I am struck, for example, by the fact that, in some large lecture halls, many students automatically seat themselves in the back of the room and far from the podium, without taking into account in the least the double difficulty that arises both for the speaker—professor or fellow student giving a presentation—who must make himself or herself understood and for those

listening. Used to hearing the voice as it sounds when watching television, that is, proximate, isolated, biased in favor of high pitches, intelligible to a fault, like a face seen continuously in close-up and harshly lit, they no longer live in a human acoustic world and forget to adapt to a voice produced by acoustic means. They inhabit an abstract world, where exigencies such as making your voice carry, controlling your speaking pace, and appreciating that distance plays a role in making yourself understood are not taken into consideration. Moreover, they are not conscious of this world as such.

Has Sound Essentially Changed?

The theorist Béla Balázs, who put forward so many rich insights on the nature of sound, forcefully affirmed already fifty years ago an idea that is debatable but still widely shared. Sound, he said, has no image: "What speaks to us from the screen is not the image of sound, but the sound itself. This sound is affixed to the film, which gives us to hear. Sound has no image. The sound itself is repeated with its original measurements and physical properties. It is itself that speaks again from the screen. There is no difference in reality, in dimension, between the original sound and the reproduced sound as there is between objects and their images."[11] On the contrary, Alan Williams defends the idea—and I agree with him—that: "it is never the literal, original 'sound' that is reproduced in recording, but one perspective on it."[12] For his part, Rick Altman writes, "Revealing its mandate to *represent* sound events rather than to *reproduce* them, recorded sound creates an illusion of presence while constituting a new version of the sound events that actually transpired."[13]

The matter is quite complex, but in any case two attitudes are to be avoided. The first is approving wholeheartedly Balázs's thesis, published back in the 1940s but still professed—and in fact the default majority position, since ratified by the use of the same term "sound" for what we hear on a medium and in situ—and professed without going to the trouble of reflecting on the contradictions that it entails. Second and to the contrary is an unreflective rush to reject this thesis in order to espouse the opposite one—the very one of which I am an adherent, that Williams and Altman also defend, and concerning which the composer and researcher François Bayle, via his concept of the sound-image [*image-de-son*], opened up the theorization.

Let us first look into the internal contradictions that Balázs's postulate generates—a postulate that has, among other merits, that of tackling

a real problem. From a certain point of view, in fact, a concept like that of Schaeffer's sound object bypasses the problem. In the latter's *Traité des objets musicaux*, it is clear in effect that there can be no sound object per se without it being subject to repeated listenings, subject to observation, and thus, implicitly, fixed. But this relistenability is given more as a condition for observation—of the type: seize the bird and freeze it in flight—than a change in ontological status. From another point of view, Balázs oversteps the mark, since sound transmitted by loudspeakers is far from reproducing the nuances, details, and spatial qualities of the original sound, and the author is clearly aware of this. What he puts forward is that we are only talking about a difference of degree and not of essence. Ontologically, sound in situ and projected sound are, in his view, propagated by sound waves. One might object, however, that images that come to us from reality and painted representations, photographs, television screens, and cinemas also affect us via luminous phenomena reaching our retinas.

For my part, I would say that there is such a thing as a sound-image [*image-de-son*] (to use the formulation proposed by Bayle, the apparent simplicity of which hides a real theoretical novelty).[14] It is just that this image does not correspond to the same definition for visible images and that perhaps Bayle's use of the word "image" leads to confusion. One of the likely reasons that we hesitate to consider fixed sound an image is the absence of an encompassing and delimiting frame that would make it exist outside of the world of other sounds. This lack of a sonic frame—made even harder by the fact that some sounds transmitted through loudspeakers come at us from several directions at the same time—seems to make it impossible to isolate the sound image from the real world. And yet, something new has made its entry with modern technologies, and whatever the difficulties in naming and defining it, we cannot say that things are "like they were before."

10))) The Audiovisual Couple in Film

AUDIO-VISION

Audiovisual coupling, that is, the treatment of hearing and sight as enjoying a privileged relationship of complementarity and opposition among the other senses, was certainly not created by sound film and then television. It would appear to go back quite a ways, and very early on its presence is felt in human life. According to Élisabeth Dumaurier: "Children from around ten up until sixteen weeks of age pay more attention to a presentation in which sounds are synchronized with lip movements and show less interest when the lip movements precede by 400 milliseconds audition of the sound produced." She adds: "Starting at three months of age, an infant stares much longer at a screen accompanied by a little melody than at one where the loudspeaker is silent."[1] The precocious character of audiovisual coupling, which makes the eyes and ears a privileged pair, is attested in historical texts well before the emergence of that which we today term *audiovisual*: the simultaneous representation or inscription of the visible and the audible. This may well be the case because language takes the two complementary forms of oral and written. Notwithstanding, it is audiovisual technology that isolates and systematizes the putting into relation of sound and image in a closed context, cut off from other sensations (thermal, tactile, olfactory, etc.) and founded on a framing of the visual.

My specific work on audiovisual relations in film, which I have laid out in several books over the past thirty years, has led me to create an entire array of concepts to grasp the matter. Thus, with the term *audio-vision*, I designate the type of perception that is peculiar to film and to television, in which the image is the conscious focus of attention, but where sound at every moment brings about a number of effects, sensations, and significations that, thanks

to the phenomenon of projection that I label *added value* (more on this to follow), are credited to the framed image and appear to emanate naturally from the latter. If the projection of the heard onto the seen is in the case of film and television much more striking and systematic than in the other direction—the likewise real projection of the seen onto the heard—this is because of the visible presence of the screen, which is treated as a scene: a *visible frame of the visible*, which exists prior to the apparition of the image and that survives its extinction. The loudspeaker, even supposing it to be visible, is no more the frame of the audible than the lens of the projector is that of image. This is all the more so when there are several speakers, when these emit the same sounds, and when these sounds merge.

Mirroring the audiovisual situation, the term *visu-audition* would apply to a type of perception that is consciously concentrated on the auditory (as in a concert, but also when you are attending to somebody's words) and when audition is accompanied, reinforced, aided by—or on the contrary deformed or parasitized by, but in any case influenced by—a *visual context* that inflects it and that can lead to the projection of certain perceptions onto it. A classical music concert, with the instrumental causes in sight, but also a composer of electronic music or film or video sound editor who makes use of graphical points of reference (on a computer screen) are both situations of visu-audition that we encounter today. The melomaniac who follows the score while listening to a musical work finds herself in the same position: the score makes her over-hear certain details and, in a sense, mishear others.

I set forth these two concepts of audio-vision and visu-audition when I realized that it was hardly coherent to approach an audiovisual art by proceeding as if sound was naught but a component part added to the image. With numerous examples, analyses, and experiments, I have demonstrated that you cannot study a film's sound separately from its image and vice versa. In fact, their combination produces something entirely specific and novel, analogous to a chord or interval in music. This domain being new and not yet codified, it was necessary to invent many new expressions to designate audiovisual effects long since known and used but that had been deployed as intuitively known devices, without applying precise terms. This is why the term *effects* is still in use—a concept that has now been devalued, albeit it was often employed with reference to the opera, theater, music, and, in short, all those arts based, like cinema, on spectacularity. The question before us is of knowing whether these effects make up or will make up a rhetoric consciously grasped by the spectator or if they will remain "effects." But

the same could be said for musical effects such as certain chord progressions and diminished seventh chords, long since used on a public that *felt* them without being able to identify or understand them. Let me insist on the fact that in what follows, I am employing a descriptive logic: nothing in it is all or nothing, the exception does not negate the rule, and, furthermore, no value judgments are brought to bear—no segregation among different effects, the "good" versus the "bad," the "trite" versus the "interesting."

Added Value, the Illusion of Redundancy, Audio-Visiogenic Effects

The audiovisual combination thus functions not like a simple addition of likes or contraries, but rather like a mixture in which the spectator rarely takes into account the sonic aspect. To use a musical comparison, it is like how, with respect to the emotions that a given melody produces, a nonspecialist auditor is not in a position to take into account the role played by the "accompanying" chords, with the result that he attributes to the melodic line alone (which corresponds to the image) the emotion or meaning that in reality proceeds from the ensemble of musical elements and from their association. Very often, in fact, when sound adds meaning to an image, this meaning seems to emanate from the image alone. This is what I call the effect of *added value*—to be understood as added to the image. What is at stake here is the sensory, informational, semantic, narrative, structural, or expressive value that a sound heard in relation to a scene leads us to project onto the image, to the point of creating the impression that we see in the latter that which in reality we "hear-see."

This effect, which is very much in current use, is most of the time unconscious for those who are subjected to it. To become conscious of it and to locate the mechanism, we must decompose the audiovisual mixing, attending separately to the sound and to the image in a given sequence. Only then do we perceive that sound by various effects ceaselessly influences what we see. The added value is in part bilateral (the image in return influencing our perception of the sound), but because of the conscious polarization of the movie buff or television viewer in the direction of the screen and the seen, the result is that these influences going the other direction are usually and as a whole—in film as in television—reprojected after all *onto the image*. On the other hand, in the case of *visu-audition*, such as during a concert, in which by cultural tradition conscious attention is given over to hearing, *added value* works primarily in the other direction. For example, the sight of an energetic

gesture by an instrumentalist will give the impression of a more powerful sound.

Getting back to film, is it appropriate to speak of *audiovisual* effects? These effects have in fact an audiovisual *cause*, but the outcome of the combination does not consist in perceptions of images and sounds as such, but in perceptions of space, matter, volume, meaning, expression, and spatial and temporal organization. This is why I would prefer to speak instead of *audio-visiogenic effects* (that is to say, effects created by sounds and images). The essence of these effects, as we have seen, is to not be spotted as such, but much rather to create, in many cases, the illusion that the sound does nothing other than double up what the image would already say by itself. Within the audiovisual relation, there is thus a fundamental misapprehension: we are led to believe that the relation is one of redundancy.

The most banal and apparently least debatable example invoked as a case of redundancy—a dialogue in which the two interlocutors are filmed and heard—is precisely not one. That is, it is not in fact one unless we are considering a deaf person who has learned to read lips (and here only in cases where the dialogue is not dubbed and the interlocutors are viewed head-on), the sound cannot in general be deduced from the image and the text pronounced deduced from what one sees. Symmetrically, the faces of the characters, their dress and frequently the setting in which they are located, their gestures, and so forth, cannot be ascertained from the sound alone. Therefore, there cannot be audiovisual redundancy in this case, even if one feels that there is.

My theory of the audiovisual in film rests on a model of *asymmetrical* description, in which sound and image are not two complementary and equilibrated components. One can show in fact how the frame (itself visible) in which the image is inscribed is also the frame in relation to which sound is spatially positioned. If sounds are so easily projected by the spectator onto the cinematic image, this is in fact because the latter is inscribed in a frame that can be situated in space, whereas the sound—at the risk of repeating my oft-stated position—has none. The visual frame is thus the ground of the *double projection* made onto the image by the "audio-spectator": that of images (since she reprojects onto an image those previously seen during the film) and that of sounds.

Cinema is actually based on the principle of a *visual frame of images*—generally speaking there is only one such frame—that exists prior to their disparate and turbulent succession. At the same time, the frame is what allows

us to speak of "the image" in the singular, since these images never overflow it. Yet, we have established that *there is no sonic frame for the sounds*. Sounds are only contingently framed by the image itself, which localizes them (thanks to the effect of spatial magnetization already evoked), anchors them, and attaches them—or not—to a finite object in space. Or, inversely, the image, in not incorporating them, fixes their existence in another invisible scene or in a contiguous space (off camera). Moreover, contrary to the enclosure of the image in a frame, sounds in a film can be piled up on top of one another without a cap on either quantity or complexity, and they are free from the laws of realism: film music, voice-overs, dialogues, realistic ambient sounds, and so forth, can mingle in a film. This absence of a sonic frame is one of the principal reasons that has long since led me to formulate the notion that there is no soundtrack per se. With this notion, I give to understand that the diversity of sounds that appear in film (words, noises, music, and a variety of others) and that contribute to that film's meaning, to its form, and to its effects do not constitute by themselves and by the fact alone of belonging to the sonic register a global, united, and homogeneous entity. In other words, in cinema, the relations of meaning, of contrast, of agreement, or of divergence that words, noises, and superimposed musical components are capable of having *among themselves* in their simultaneity are much weaker—indeed nonexistent—compared with relations that each one of these sonic components, on its own, maintains with a given visual or narrative component simultaneously present in the image.[2]

Audiovisual relations are by and large cultural and historical, but they rest as well, both in everyday life and in the audiovisual arts, on universal psychophysiological phenomena that are not particularly understood (this is probably because of the increasing specialization of researchers, which leads them to be less attentive to connections between the senses and to dedicate themselves to a single one of them). In the first rank of these phenomena comes the effect of "synchresis." A portmanteau word made up of "synchronism" and "synthesis," the term *synchresis* is one I created to name a spontaneous and reflexive psychophysiological phenomenon, contingent on our nervous and muscular responses, and that consists in perceiving as a single and same phenomenon that manifests itself both visually and acoustically the concomitance of a *punctual* sonic element and a *punctual* visual element, starting from the instant that these two are produced simultaneously and with this sole necessary and sufficient condition. This phenomenon, which is not under the control of the person subjected to it, thus leads to the

instantaneous establishment of a tight relation of interdependence between images and sounds that in reality often have scarcely any relationship and to the positing of a common origin, even if these images and sounds are in nature, form, and source totally different. In film, this phenomenon lets one use as sound effects for the footsteps of a character the greatest variety of sounds and to do so with complete liberty of expression.

Synchresis also allows for playing with effects of contradiction and discontinuity (disproportion of the voice in relation to the body in a cartoon, inversion of gender in certain comic and fantastic stories—a man's body with a woman's voice, etc.). These are effects that without synchresis would lead to a pure and simple decoupling of the "audio" and the "visual." In short, without synchresis, sound would be obliged to resemble reality and would have much reduced expressive possibilities (because, it must be said, sound in films only roughly resembles sound in real situations).

The word "synchresis" is perhaps a bit ambiguous, since it is not a matter of synthesis in the sense of overcoming or reabsorbing a difference. The image remains the image, and the sound remains the sound. That which they work together to represent exists outside of them, like a projected shadow. *If there is an audio-image*—and this is an expression that I have used and do use—*it is not that which is on the screen*. It is mental, just like the mental space created by cutting and editing in film production.

The second universal—that is to say, noncultural—psychophysiological condition that enables audiovisual relations is the *spatial magnetization* of sound by the image. Here it is a matter of the process that I have already evoked by which, when we visually situate a sonic source at a certain point in space and when for a variety of reasons (the sound is electronically amplified, the sound is reflected off of surfaces, etc.) the sound with which it is associated comes mainly from another direction, we nonetheless "hear" the sound coming from where we *see* its source. And this occurs unless—a notable exception—the sound really moves in space (e.g., from one speaker to another, as in the case of Dolby in cinema). In this instance and for psychophysiological reasons, our attention is drawn to the sound's real acoustic localization. Spatial magnetization made possible classical talking cinema, where we accept that in monophonic reproduction the voices of characters do not really move in correspondence with their visual movements, and this is most notable along the lateral axis (left to right and vice versa). Similarly, sounds that are situated "off camera" are only mentally such. They are so in the mind of the spectator who projects visually observed movements

onto the sound (which is a case of "added value," here from the image to the sound).

Spatial magnetization works all the better when sounds are synchronized with images, and so it implies synchresis in many instances. In the case of cinemas equipped with multitrack reproduction, depending on the layout of the speakers—that is, depending on the greater or lesser distance between them and on whether they are installed outside of the axis of the screen—depending on the position of the spectator in the room, and depending quite a bit on the mixing of the film, spatial magnetization can be either confirmed or on the contrary contradicted by the *real* provenances of the diffused sound.

The Vococentrism of Hearing: Verbo-Centered and Verbo-Decentered Audio-Vision

The analysis of audiovisual relationships must also take into account the fact that the conscious auditory attention of a human being is not directed indiscriminately to any and all sounds. Above all, it is *vococentric*. I use the term *vococentrism* to name the process by which, given a set of sounds, the voice attracts and centers our attention in the same way that the human face does for the eye in a film shot. At the level of sound, vococentrism can be crossed out, so to speak, or attenuated by certain procedures. In the films of Jacques Tati, for example, fluctuations in the sound level and in the intelligibility of the script—but also the care that the director takes to establish that these dialogues are not essential to the plot properly speaking, not to mention, of course, the way in which via the image he puts the characters, filmed in wide angle, at a distance—are so many procedures intended to prevent our attention from latching onto voices. This does not mean that in classically vococentric films the other sounds, effects and music, are somehow not important. On the contrary, they also play a decisive role. It is just that this role works at a less conscious level, as do, in a string quartet or mixed choir, those parts or voices labeled intermediary (the tenor and alto, which are neither at the top of the range nor in the bass). It is only when these parts are absent or different that we get the feeling that something has changed, even though the high part to which we pay conscious attention has stayed the same.

But in classical sound cinema the voice is also the principal vehicle for the script. I have therefore suggested using the term *audio-(logo)-visual* instead

of *audiovisual* in order to shine a spotlight on the fact that in the majority of cases, language is present in film in a central, decisive, and privileged way. This is true both in written form (title cards in silent films; captions, credits, and subtitles in sound films) and in oral form (dialogue, interior monologues, voice-overs, etc.), and language can from these various positions dictate, regulate, and legitimize the structure of the whole. The formulation *audio-(logo)-visual* would allow us to avoid the reduction of cinema to the matter of sounds and images. Words not only constitute, in fact, the center of conscious attention, but often also the key to audiovisual structuration, to the point that in certain instances, they completely guide and organize the other components that surround them. They may do so either openly (as in Sacha Guitry's *Le roman d'un tricheur* [*The Story of a Cheat;* 1936]) or, in the case of the classical dialogue-based cinema that I label "verbo-centric," in a more insidious fashion, when the entire film is conceived and organized in order to uphold, assist, and legitimize listening to the lines of dialogue and granting them the status and value of plot, all the while effacing our perception of the dialogue as such. The (consenting) spectator of classical verbo-centric cinema does not imagine herself to be listening to a stream of dialogue around which everything is organized—which is the real situation—but is convinced that she is attending to a complex plot of which the dialogue would constitute but one part and a seemingly almost negligible part at that (the case of many of Hitchcock's films, which with few exceptions, such as *Psycho* [1960], are chatty).

On the other hand, we can arrange among the instances of verbo-decentered films those apparently paradoxical cases in which the dialogue is plentiful and important but where its abundance is not "dissimulated" or "absorbed" by the mise-en-scène and is perceived as such, without the rest of the cinematographic components simply conspiring to facilitate listening to it. This covers films from Fellini and Iosseliani (polyglot abundance of dialogue) up to those of Tarkovsky (verbiage of the characters confronted with their impotence vis-à-vis the mystery of the cosmos), passing via those cases where the visual and sonic style of the film relativizes the spoken word and treats it like one sound among others (in Tati, for example, as mentioned). Just as it does not suffice to blur or mask a component in order to rob it of its central importance—on the contrary, it is often in order to underline its importance that it is treated thus—it does not suffice to interrupt or muddle speech in order to make a verbo-decentered film, since speech can thereby still be designated as crucial. In this sense, we can say that the films of

Godard—where the lines are often muddled—as in those of Orson Welles—where the characters interrupt one another—are of the verbo-centric type, without their losing anything of their originality.

Types of Audio-Visiogenic Effects

The audio-visiogenic effects that I will now enumerate can be categorized as such:

- Effects of meaning, atmosphere, and content (these are obvious and I won't be dealing with them)
- Effects of *rendering* and of matter, creating sensations of energy, texture, speed, volume, temperature, and so forth
- *Scenographic* effects that concern the construction of an imaginary space (notably by the play of *extension* and of *suspension*)
- Effects that concern time and the construction of a temporal *phrasing*: play on the temporalizing of the image by the sound, and so forth (marked *synchronization points* that alternate more or less with "fluid" sections, etc.)

Rendering means that a sound is recognized by the spectator as true, effective, and apt, not that it reproduces the sound made in reality in the same sort of situation or by the same cause. Rather, it renders—that is, translates, expresses—sensations that, while not specifically sonic, are associated with that cause or with those circumstances evoked within the scene. As an example of "rendering," that is, of a sound that translates not another sound but speed, force, and so forth, consider the sound effects that punctuate action scenes in films, such as the whistling of sabers or swords in martial arts films, which translate agility. Consider the sounds of plummeting bodies in scenes where someone falls. These translate the violence that the character suffers, whereas in reality the same fall might not make a single noise. Or again, consider the sound of the blows in a boxing film, and so forth. But we are also talking about all those sounds that are intended to give the impression of matter or immateriality, of fragility or resistance, of sensuality or austerity, of emptiness or fullness, of weight or lightness, of dilapidation or brand-newness, of luxury or destitution, and so forth. These sounds are created with these aims rather than with the goal of reproducing the real sound of the object or character in question. Indeed, rendering is always the rendering of something.

The use of sound as a means of rendering and not of reproduction is made easier by its flexibility with regard to causal identification. In other words, sound is easily verisimilitudinous, or, if you prefer, the spectator is exceedingly tolerant of the fact that a sound does not resemble what would be heard in reality because, as I have already shown, there is no strict law uniting a sound to its cause or causes. The rendering at stake here is created within the frame of an audiovisual relation. This rendering is thus projected onto the image and illusorily felt as directly expressed by what one sees (whence the illusion of redundancy).

The flexible use of *materializing sound indices* (a concept that I first laid out in chapter 7) is another means of audiovisual expression, which in this case concerns the perception of matter. In an on-the-spot listening situation as well as in a film or a piece of musique concrète, a voice, a footfall, or a note can consist of more or fewer materializing sound indices (crunching, creaking, or hissing in a footstep; minor contingencies of attack, resonance, rhythmic regularity, or precision in a musical sequence; etc.). Materializing sound indices are a crucial cinematographic means of rendering to the extent that they are measured out in doses within the sonic conception of the film. This dosing is done most notably in sound editing, which either eliminates such materializing sound indices entirely, creating a disincarnated and abstract world, as with Tati, or on the contrary accentuating, which makes us feel matter and bodies, as with Bresson or Tarkovsky. Between these extremes there are all sorts of intermediate steps. They also play a role in dialogues, since the voices heard in a film can be more or less "materialized" by details such as slight oral clicks, sounds of breathing between phrases or words, coughs, rasping voices, and so forth. Notably, voice-over commentaries are often emptied of their materializing sound indices with the avowed aim of not attracting attention to the physical person of the speaker.

Other audio-visiogenic effects contribute to the *audiovisual scenography*. By this, I understand everything that, in a given conjunction of sounds and images, concerns the construction of a narrative scene. This takes place most notably by the play of comings and goings in the sonic field (a character or vehicle that enters the visual field or that leaves it, preceded or followed by a sound), by the contrast or identity between the sonic *extension* (explained below) and the visual framing, by the comparison of the size of characters on the screen to, acoustically speaking, the proximity or distance of their voices and more generally the sounds that they emit, and so forth. On this

last point, "sonic perspective" rarely strictly reproduces and reduplicates the visual perspective, or, if it does so, it does only approximately and timidly.

In Ridley Scott's *Blade Runner* (1982), the set and the characters are often shot from very close up, whereas their environment is acoustically described or suggested by sounds (crowds, vehicles) that evoke a very large space. You are present at a sort of complementary and compensatory relationship between close-up vision and wide-angle hearing. In Fellini's *Satyricon* (1969), on the contrary, several scenes combine a visual staging based on emptiness and the decentering of characters (they are often shown in wide-screen, backed up against a wall or other partition, at the bottom of a gigantic CinemaScope frame) and an oneiric sonic staging where the voices of the same characters—who are thus not at the same distance as the bodies that "emit" them—are close, invasive, and intimate. They speak into our ears as if in a dream.

Extension is one of the effects that relates to the construction of space by the combination of sound and image. I designate with this term the more or less wide and open concrete space that ambient sounds and sonic scenery describe in relation to a visual field and that is constitutive of the geographic, human, or natural spatial frame from which this visual field is, at it were, sampled. Take a case in which the setting of the action is limited to the interior of place from which the camera never withdraws (Hitchcock's *Rear Window* [1954] or Bresson's *Un condamné à mort s'est échappé* [*A Man Escaped*; 1956]). The extension will be labeled "restricted" when the sounds that are heard are uniquely those that are produced within this closed space. It will be broader when we hear off-camera sounds from the staircase or from neighboring apartments. It will be broader still if sounds from the road intrude. And even broader if we hear distant sounds (boat horns, train whistles, an airplane overhead, etc.). All of these are choices left to the director and to the sound technician, and according to and in keeping with expressive and scenic needs.

Any of these decisions is in fact guaranteed to appear "natural" to the spectator, but they contribute to situating what he or she sees from one moment to the next in relation to a reality that is more or less broad, and they tie a given point in the action to another, with a certain narrative, expressive, dramatic, or other formal aim. What is at stake, for example, is to make nature or solitude felt in relation to an interior setting or, on the contrary, the thronging and crushing of crowds. Or perhaps the goal is to direct the attention of the spectator or of a character, to create an effect of meaning,

of contrast, or yet again to enclose a space around the characters or around what is shown on the screen, and so forth. Within the parameters of such work, I can only rapidly hint at all that Dolby can contribute to audiovisual scenography. These contributions are made above all in relation to what I call the *superfield*, or otherwise the drawn field, in multitracked Dolby cinema: ambient sounds of nature, urban hums, music, rustlings, and so forth, which surround the visual space and can come from speakers located outside of the strict limits of the screen. As I wrote in *Audio-Vision*: "Thanks to its acoustic precision and relative stability, this set of sounds manages to seize from the visual field a sort of autonomous existence, which does not depend from one moment to the next on what is seen, but which nonetheless does not achieve, on the structural plane, an autonomy and cohesion of sonic relationships that would justify speaking of a soundtrack."[3]

Suspension is a dramatic audio-visiogenic effect that consists in taking a fictional setting where the frame would presuppose for our audiovisual habits the presence of ambient sounds (natural, urban, etc.) and in interrupting these sounds or, indeed, in excluding them from the start, while the causes of the sounds still exist in relation to the action and even within the image. The effect created is often one of mystery or menace, and at times a sort of poetic suspension or derealization of the world. For example, the lovers' walk at the end of Fellini's *Nights of Cabiria* (1957): a wonderful, wooded natural setting, but not a single birdsong is heard, which creates a mutely alarming atmosphere. We learn soon after that the man wants to kill the prostitute whom he has led to the edge of the cliff.

Having considered space, let's turn to time. The latter is a facet that is often overlooked in cinema, and sound—a component that is by definition temporal—plays a decisive role in its construction, usually thanks to added value. We can call "audiovisual phrasing" everything in a film sequence that concerns the division of time and of the rhythm by breathing, focal points, punctuation marks, rests, temporal crystallizations, anticipations, and relaxations. *Temporalization* is an audio-visiogenic effect that constitutes an instance of added value, in which the sound grants duration to images that possess none in themselves (totally still images as in Chris Marker's *La jetée* [1962] or images that show an empty interior or immobile characters) or where the sound inflects and contaminates the duration peculiar to the images. In particular, sound can impose a linear and successive duration on images that in themselves do not presuppose in their concatenation an idea of temporal succession (the sonic *linearization* of images) and, in a word,

vectorize the planes, that is, orient them in time, impress on them a sense of anticipation, of progression, of forward motion, or of imminence that they do not in themselves possess (*vectorization*). At the beginning of Lang's *Testament of Dr. Mabuse* (1933), the camera sweeps across the interior of a basement crowded with objects. Without the sound, this exploration using a sideways tracking shot would appear disinterested, objective, and just going along. With the sound—here acousmatic—of a powerfully pulsating machine off-camera, the plane is stretched and oriented to an imminent goal: the discovery of the source. The plane is *vectorized*.

Audiovisual phrasing in film is also constructed by the parceling out of *synchronization points*. I use this term to name, in the audiovisual chain, a particularly salient instant of synchronous encounter between concomitant sonic and visual moments or, to put it in somewhat different terms, a moment wherein the effect of synchresis is particularly marked and emphasized. The frequency and arrangement of synchronization points in the course of a sequence contribute to the phrasing and rhythm, but they also create effects of meaning and emphasis. A synchronization point can just as well be produced *within the interior of a shot* as between a visual cut (change of shot) and a sonic cut or a reply in the dialogue. For there to be a synchronization point proper, synching alone does not suffice. In other words, a scene of filmed dialogue that involves a lot of lip-synching does not for all that constitute points of synchronization. The latter are defined as *more salient* and *more significant* moments, which come about according to various criteria such as the suggestiveness of a perceptual rupture (simultaneous cuts in sound and image), mutual reinforcement between a visual effect (close-up) and a sonic one (particularly near or powerful sound), or the affective or dramatic suggestiveness of a synchronous detail. Context can also play a role. Thus, for instance, the first synchronized encounter of a spoken word and the sight of the speaker's face after a long period of desynchronization (e.g., after lingering shots focused on the listener, with the speaker off camera) makes itself felt as a synchronization point. The latter can also often be prepared and produced as the end point of *temporal vectors* (more on these below).

An easily reproducible experiment that consists in creating a random audiovisual juxtaposition by starting at the same time any piece of recorded music and any visual sequence (borrowed from a DVD where you have muted the sound) illustrates well how we are greedy for synchronization, so to speak: seeking out the least synchronization points, however absurd, and

constructing them on the flimsiest of pretexts. This experiment also makes obvious the need for scansion and punctuation in an audiovisual sequence and the spectator's tendency to find meaning in any concomitance, be it intentional or by chance.

I use the term *temporal vectorization* when a certain number of sonic and/or visual components that constitute a temporal evolution (trajectory, drawing near, distancing, etc.) are juxtaposed and constructed in such a way as to anticipate their crossing, their meeting, or their collision after a certain more or less predictable time lag. Such anticipation is then either fulfilled or sidestepped, as it were, and the crossings can take place sooner or later than one would have expected them to do so. An image can even suggest two simultaneous temporal vectors (e.g., when we witness the movement of a character in the direction of a given point and in tandem the movement of the camera in an oblique or perpendicular direction in relation to the character). The same of course goes for the sound, as in the case of Scorsese: for instance, a phrase of dialogue (making us wait for the object after the verb) and a line of melody (with its cadenced contour), when heard at the same time, make two temporal vectors.

Audio-Division, "Phantom" Audio-Vision, and Audiovisual Dissonance

Thus far we have imagined instances in which sound and image cooperate, producing a result that is usually felt as an "effect of the image." I ought also say something about how the audiovisual relation is equally founded on lacks: the valorization via sound of something lacking in the image or via the image of something lacking in the sound (as, e.g., the effect of "suspension," mentioned above). In this case, I am tempted to play on words and speak of "audio-division." The term would indicate the audio-(logo)-visual relation considered from the angle not of a complementarity that closes back on itself and not of the restitution of an imaginary natural totality, but rather of a generative concurrence—taking place alongside audio-visiogenic effects of association, of added value, audiovisual phrasing, scenography, and so forth—of unexpected lacks, hollowing effects, and various divisions. In other words, even so-called realistic sound does not make good all the questions asked by the image—an image that sound divides and vice versa. For example, a *phantom sound* in an audiovisual sequence is one that the image suggests but that is not heard, whereas other sounds associated with

the scene are audible. This leads to a greater tendency to grasp as implied [*sous-entendre*, literally to "under-hear" (trans.)] the former, insofar as they are absent.[4] In Fellini's films, notably, you hear the voices of characters who talk while walking, but not the sound of their footsteps, which remains negatively presented. Inversely, a phantom image is when a specific image is suggested by a sound but the visible correspondence is lacking.

Finally, audiovisual dissonance is an effect of narrative contradiction between a punctual sound and a punctual image or between a realistic sonic ambience and the frame in which it is heard. For example, in Godard's *Prénom Carmen* [*First Name: Carmen*] (1983), the squawks of the gulls and the sounds of waves that Godard has us hear over the images of a nocturnal Paris; or, again, the contrast between an enormous voice and a tiny body, which Tex Avery found so amusing to create (see *The Cat That Hated People*, in which a kitty speaks with a gravelly, ranting voice). When the contradiction takes aim at size, it seems not so much to produce a dissonant effect as one that is closer to monstrous. The term *dissonance* seems to me more appropriate than that of *counterpoint*, unsuitable in this context, which in music concerns a juxtaposition of lines that can perfectly well be parallel at times. Yet there is not "dissonance" but rather metaphor and rhetorical effect when in *Love Me Tonight* (1932), Mamoulian has us hear in synchrony the sound of a thunderclap with a vase that falls and breaks. It is the moment when the aristocrats learn that he whom they had thought noble and whom they had admitted into their world is nothing but a tailor ("The baron is a tailor"). The effect, thanks to the context, is immediately translated by the spectator into the equivalent of the set phrase: "the news struck like a thunderclap." The vague acoustic resemblance between certain sounds of falling objects and certain storm sounds allows for this acoustic homology.

Are Audiovisual Effects Codified?

Many questions remain: How did such effects emerge, excepting the rhetorical effects of which I just provided an example? Can they be assimilated to a "code," and will the standardization of the new multitrack technology (often simply called Dolby) transform them entirely? It seems to me that there are two preliminary cautions to heed on this point. First, we ought to situate cinema in relation to the history of theater, music, ballet, pantomime, and radio, from which it has borrowed not a little. A history of sound in film isolated from the history of sound and of the audiovisual more generally would

be just as absurd as narrating the history of France separately from that of the other countries in which it has been in contact. Second, I do not think that we can speak of a code in relation to such effects—at least not in the very precise sense in which there are visual editing codes that have a fixed meaning (e.g., shot reverse shot). On the contrary, audio-visiogenic effects rarely have such a predetermined meaning. A theory of audiovisual effects and in general of cinematographic *effects*—a concept in need of an overhaul—strikes me as necessary.

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PART V • listening, expressing

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11))) Object and Non-Object

TWO POLES

Schaeffer's Revolution: Reduced Listening and the Sound Object

As I have remarked, recording has been—above all from the moment that it enabled editing—the first means ever in history to treat sounds, fleeting things, as objects: that is to say, both in order to grasp them as objects of observation and in order to modify them—to act on their fixed traces. It required someone, however, to draw out the theoretical consequences of sound's new status, and this someone was Pierre Schaeffer. He was the first not so much to attempt to generalize music to all sounds as to attempt to push as far as possible what this idea implies. Among other things, this meant the creation of a system of description and classification for all sounds that he called "music theory of the sound object."[1] To this end he notably set forth the two correlative concepts of *reduced listening* and of *sound object*. In our everyday life we use very few qualifying, descriptive words concerning sounds themselves, since naming sounds and characterizing them is the least of our worries and of our needs.

In his *Traité des objets musicaux* [Treatise on Musical Objects], Schaeffer first of all defines two types of listening that cut across sound and that treat it as an index or as a message: *causal listening* and *semantic listening*. We have seen that the former is interested in gathering from a sound all those indices that can inform the auditor about its cause and the nature of that cause. We know that this is an activity that is subject to numerous interpretive errors, insofar as it is influenced by context and insofar as sound is generally vague or uncertain not in itself but with respect to the cause that one tries to discern (causal vagueness). For his part, Schaeffer did not make the

distinction that I do between causal listening and what I would designate as *figurative listening*. As for the latter, Schaeffer labels "semantic" the type of listening that, in particular contexts where it encounters a coded sonic signal, is interested in decoding this signal in order to get at the message. The standard example is spoken language, but it could also be Morse code or encrypted communications among prisoners. To indicate this sort, I prefer the term *code-oriented listening*. These two sorts of listening can be carried out simultaneously on the same sounds. For example, when you attend to what an unknown person says to you over the telephone, we have a case of semantic or code-oriented listening. When you try to make out the state of the person—sex, gender, weight, state of health—from the voice on the line, that would be causal listening.

But if at the same time you note that the voice is high-pitched or low, gravelly or smooth, then we of course have a case of that level which Schaeffer both baptized and posited as *reduced listening*. In this instance, listening makes willful and artificial abstraction from the cause and from meaning—and I would add, from the effect—in order to attend to sound considered inherently, that is, for those sensible qualities not only of pitch and rhythm but also of grain, matter, form, mass, and volume. In relation to the other forms of listening, it is reduced listening that takes a sound, whether verbal, "musical," or realistic, as an object of observation in itself, instead of cutting across it with the aim of getting at something else. This is an activity that is strictly voluntary and cultural. Nothing in daily life or even in the majority of extant art forms makes us do so. Reduced listening is thus in opposition to the two other, more quotidian, utilitarian, and spontaneous types of listening. It could also be said that we all practice an unconscious reduced listening, but that this is above all to furnish elements for interpretation and deduction for the two other types. Such spontaneous reduced listening forgoes words and therefore does not cross a certain threshold of finesse and of intersubjective development. On the other hand, spotting the play of pitch and of rhythm in a musical piece certainly implies reduced listening. And yet this only concerns a thin slice of the perceptual qualities of sound—even musical sound—and it relegates those that are not tonal and without a regular pulse—the majority of sounds, that is—to the category of "confusion."

Reduced listening as defined and advocated by Schaeffer is, on the contrary, a nonspontaneous and collectively practiced procedure. It puts in play a specific method, verbal exchange, and naming. Doing it, which is indispensable for anyone who wants to understand in what it consists, very quickly

foregrounds those "elementary sonorous forms" with which everyone is familiar without having words to designate them. Finally, reduced listening as a practice does not imply censure. It does not oblige us to repress—even less to deny—our figurative and affective associations. It is only a matter of placing them temporarily outside of the field of naming and of observation. Just as with the visual register, describing an orange in terms of form, color, or texture does not oblige us to forget that we are dealing with a fruit or to proceed as if we did not know this. We merely submit it to a descriptive interrogation that brackets the nature of the object, the associations that it occasions, the satisfactions that it promises, and so forth. As for the act of naming and of description itself, we are not excluded from drawing a certain pleasure as well as instruction.

As a correlate of reduced listening Schaeffer posited a specific, perceptual sound object that is independent of the material and physical cause of the sound and yet nonetheless possesses veritable object status. The sound object is "every sonic phenomenon and event perceived as an ensemble, as a coherent whole, and heard by means of reduced listening, which targets it for itself, independently of its provenance or its signification."[2] Among others, this puts forward the simple question of the delimitation of such an object qua totality, of how it is cut out of the mass of sounds that present themselves to us. In the case of listening to a piece of classical music, the question of bounding perceptual unities is more complicated than might appear because the unity of notation (i.e., the note) is not in the least an ipso facto unity of perception. For example, the "characteristics" of Mozart's concertos—arpeggios and rapid scales—are much more perceptual unities than the notes from which they are made.

It is also important to state what the sound object, as Schaeffer conceives of it for the purposes of a generalized music, is not.

- It is of course not the sounding body, if we so designate the material source of the sound object.
- It is not the physical phenomenon, which can be evaluated in terms of frequency, amplitude, etc., which devices can measure.
- Nor is the sound object a snatch of a recording, a segment of magnetic tape, or the sector of computer memory where it is stored, such a material or "immaterial" fragment being readable in different ways.
- It is not a symbol marked on a score. A notational symbol only has the value that we attribute to it according to context. Further, as we

have seen, a sound object can be "notated" on a score by a complex and involved combination of symbols.

- Last and not at all least, the sound object is not the mood of the listening individual and is not to be handed over to subjectivity. It remains identical across various acts of listening and "transcend[s] individual experiences."[3]

Needless to say, the fact that a perception such as the sound object might be considered objective has been debated. The opposing point of view is that "there are as many sound objects as there are auditors," which is both true and false. It is not the psychology of the auditor that matters, it is the particular spot where the latter is positioned that does. Take the example of a convertible car driving along: around it, at a given moment, a sound vibration that I call a verberation emanates. The driver of the convertible hears one thing; somebody standing by the roadside hears another. These two sound perceptions, one of which is constant and smeared and the other which conforms to the approaching/peak/moving-off model, have two very different profiles, but neither one is "subjective" in the sense of arbitrary. Each one is rigorously correlated to the fixed or moving position that the auditor occupies.

All of these qualifications lead us to understand—only implicitly, however, and it is never simply and clearly stated in the *Traité des objets musicaux*—that there is no observable sound object unless fixed onto a medium. Schaeffer often said that his starting point was an effect familiar to all but that nobody took seriously at the time: the experience of the scratched record or closed groove literally replaying a fragment of sound, exhausting its semantic or affective content as it goes, and becoming in the process an object the multiple facets of which ought to be apprehensible through repeated listening.

An object needs outlines, and since we are talking about sounds, what would be more natural than placing them in time, seeing them in beginnings, middles, and ends. Not an incoherent gambit given the impasse that we would run up against if we opted for the space, properly speaking, into which the sound object is inscribed (distance, movements, possible reverberations that prolong a given sound). Schaeffer does not concern himself with space in this sense in his descriptive undertaking and instead proposes *time as the space where the object inheres*. But the ear has an average time for global apprehension of sounds—a temporal field of audition just as there is a field of vision—and it is in relation to the way in which sound objects inhere or not within that temporal window of mental totalization that, for

Schaeffer, these objects are classified or, indeed, isolated or not qua objects. Defined as enclosed within a temporal listening frame, this notion of sound object—and this is one of its limitations—is applicable only to a portion of that which we hear. The purring of an electrical appliance that lasts for an hour is no longer an object, since it is no longer grasped within a conscious perceptual field. At the same time, however, given the way in which it is defined, the notion of object nicely formulates all the conundrums of listening. How to carve a unity from an involuted context, in which objects mingle in space and are superimposed in time? In our everyday sonic continuum just as in the artificial world of mediated music, sounds are in fact "uncuttable."

Further, even when of short duration, sound objects remain otherwise more difficult to observe than visible objects because they are incorporeal and inscribed within a given length of time. The only way to observe a sound object is to listen to it again. But then, the repeated listening that actualizes the object tends to induce a completely peculiar phenomenon of bewitchment. The object put into a loop begins by handing over its various facets to perception but very quickly threatens to cancel itself out by the repetition that ought to permit us to grasp it. This leads us to wonder if "the same" sound might not be, rather than a segment of an endlessly looping tape, something less material. Put differently: what we perceive as *the same* in acoustically different forms.

A New Classification and a New Description of the Sonic

In the mode of reduced listening, you cannot describe sounds and classify them other than by carrying out a critical examination of the traditional descriptive categories. Some of these still stand up but must be extended and relativized—this is the case for the notion of pitch—whereas others must be abandoned, since they reveal, behind their false testimony, causalist notions that are unsuitable for characterizing sound. Such is the case of timbre. After Schaeffer, we must therefore reaffirm that the notion of "timbre," which is still taught as if scientifically valid, is an inconsistent amalgam of various data. There is not "a" piano timbre. Depending on the register, on the manner of attack, and so forth, a particular sound produced by a given instrument taken in isolation and another emitted by the same instrument with have radically different tonal characteristics: a bass note on a piano only has in common with a very high-pitched note the general dynamic schema

of percussion/resonance. As for the rest, many features set them apart: the gradient of dynamic decay is slow and gradual for the bass note and rapid and abrupt for the very high-pitched one; the very bass note is markedly rich in harmonics, the very high-pitched one scant; the color of the sound's attack changes completely (attack transients are barely audible in the bass, quite audible—"noise"-like—with the high note); and so forth. This leads Schaeffer to ask the question: How can it be that we refer these notes to a selfsame instrument? For the piano he proposes the idea of a general "law of compensation" (expressed like a mathematical formula: dynamic rigidity × harmonic richness = constant).

Timbre is not in fact a homogeneous concept. It boils down to anything at all: open to allowing for the identification of a family of sonic sources and drawing relevant features for identification of the cause in any aspect of sound whatsoever. At first it was believed that what created the perception of timbre was the harmonic spectrum of a sound. Then—and notably with the help of Schaeffer's experiments—it was grasped that the unfolding of the dynamics could be just as important. Next—and this is something that experiments with the computer synthesis of sound subsequently confirmed—it was realized that other textural aspects of sound can bestow on an instrumental sound its characteristic feel. This empirical notion that is timbre proves to designate nothing other than that which makes us identify such and such source type rather than another. It is thus a fundamentally causalist notion. Each time, those features that allow identification can be as numerous and as disparate as those that enable us to recognize someone's or another's face, from skin tone to shape of the chin, from the color of the eyes to their spacing. For a long time, I found it mysterious that contemporary composers and researchers, apart from causalist conditioning, would so doggedly maintain a concept as vague and untraceable as that of timbre. Then I realized that this concept, which hardly disguises that you get out of it what you put into it, is convenient for pretty much everyone because its maintenance as a vague concept preserves the fiction of a homogeneous listening field. It preserves the myth of sound itself. If, as I am doing, you shatter timbre—the unspoken foundation on which the values of pitch, intensity, and duration, themselves distinct and locatable, find their support—then you are shattering sound entirely. Everything has to be built again from the ground up.

For Schaeffer, *typology* is the classificatory phase of his sonic venture. Let us be clear here: it entails the classification of all sounds, including traditional musical sounds as well as others, and, it goes without saying, does

so in terms of reduced listening. I will be laying out only the most basic version of this typology, the one that concerns the simplest sounds, which are reduced to nine categories. This classification comes about by cross-referencing two aspects of sound: *mass* and *sustainment*. Why these two? Mostly because with these two together we can consider two essential dimensions of sound: the way in which it is vertically situated in terms of breadth, so to speak, and the way that it deals with duration, which would be the equivalent of length. Mass, of which I will have occasion to speak again below as a morphological criterion, is defined by Schaeffer as the "manner in which sound occupies the field of pitch" and sustainment as the "way in which it extends or not in terms of duration." To sort sounds with regard to mass, Schaeffer envisages the simplest categories and distinguishes three principal instances:

- Either the mass is observable in terms of pitch (giving us to hear a pitch that we can reproduce, notate, name, sing). In this case, we will speak of *tonic* mass (e.g., a note played on an oboe or a telephone's dial tone).
- Or it is not, and we will then speak of *complex* mass (the rustling of a brook, our breathing).

In both cases above, mass has been implicitly considered as constant across a sound's entire duration. But Schaeffer envisages a third possibility, and in this case, regardless of whether the changing mass is tonic or complex, thin or thick, we choose to consider the mass variation during the course of a sound as the dominant perceptual phenomenon. Tonic masses are designated by the letter N (as in "note"), complex masses by X, and variable masses by Y.

Let's now take up the most basic cases of sustainment:

- Either the sound extends in a continuous manner, in which case we speak of *continuous* sustainment.
- Or the sound presents itself to us, relative to our human perceptual scale, as instantaneous, as a point in time, and then we will speak of an *impulse*. This will be marked as ′ (prime symbol).
- Or again, it extends by way of close repetitions of impulses, creating for our perception a sonic dotted line. We will then speak of an *iteration* or of an *iterative* sustainment. This will be marked as ″ (double prime symbol).

Cross-referencing the three principal cases of mass and the three principal cases of sustainment yields nine types of sound, which can be designated symbolically as follows:

N = continuous tonic sound (e.g., a piano note)
N′ = tonic impulse (such as the short call of some toads, a pizzicato note on a cello, a quickly pronounced sung monosyllable, a "beep" of an ATM)
N″ = iterative tonic (a string quartet's repeated notes, vibrating alarm bells)
X = continuous complex (sound of a jet of steam from a clothes iron, a long "shush")
X′ = complex impulse (impact of a drop of rain taken in isolation, the dull blow of a hammer)
X″ = complex iterative (a slowish drum roll, a burst of machine gun fire in a film noir, the typical sound of a woodpecker)
Y = continuous varied (descending whistle in imitation of a falling motion in children's play, sound of a siren)
Y′ = varied impulse (water drops falling in a partially filled basin, certain bird chirrups taken in isolation)
Y″ = varied iterative (a cascading, descending laugh)

Needless to say, we can make out no absolute borderline between a series of impulses and an iterative sound or between an iterative sound and a rough continuous sound. On the other hand, there are many cases in which we are certain that it is one and not the other. Moreover, there is a transition zone between each category, within which we might hesitate. We are, in effect, within a descriptive logic that integrates the concept of approximation. The existence of intermediary zones does not vitiate the validity of a given system of classification. Quite the contrary, it is precisely because there are cases that make you hesitate and others that do not that makes us hope that we are en route to a solid taxonomic and descriptive approach.

I have laid out above only the simplified version of the typology. As for the extended typology, which will also be found in the *Traité des objets musicaux*, it distinguishes not nine cases but some thirty or so, particularly with respect to those that Schaeffer calls "eccentric" and are characterized by a fairly long duration and less basic organization. As I have already mentioned, at stake is a classification of all sounds, including those of traditional music, which are put on an equal footing with the others and become particular instances.

Nevertheless, it is true that in his general sonic classification that he dubbed "typology," Schaeffer chose to consider as ideal—because more readily graspable by memory and thus more suited, according to him, for music making—those objects that are not too long, temporally finite, and well-structured, which he calls *formed objects* [*objets formés*]. As for the others—long sounds or at least sounds not circumscribed in terms of duration—Schaeffer chose, from his perspective (which aims at finding sounds for music), to "marginalize" them. These sonic beings find themselves relegated to the periphery of his general table, but they are not for all that muddled and stuffed into a carryall. And yet, it is precisely from here that contemporary musical and audiovisual expressions draw their materials. The latter most often have recourse to endless sounds, sounds without outlines, sound processes, and sounds that are more *transtemporal* than *in-time* and that do not offer the ear a temporally delimited and memorizable layout.

Morphology, or Description of the Sound Object

Schaeffer calls "morphology" the part of his "experimental music theory [*solfège expérimental*]" that concerns the description of sound considered in terms of its internal structure. In order to describe sound, traditional music theory was content with four disparate parameters. As we have seen, these parameters corresponded to perceptions that are more or less precise, unevenly differentiable, some susceptible to being arranged by degrees, and others not. As everyone has experienced, these four parameters of classical music theory—pitch, duration, intensity, and timbre—are incapable of accounting for the majority of nonmusical sounds (in the traditional sense); notable among these are sounds that do not present a perceived, recognizable, and fixed pitch but rather an agglomeration of frequencies or varying pitches. There are others that do not present a regular rhythmic pulsation, as in a portion of classical and popular musical, but rather unfold continuously and irregularly. In short, the sounds not accounted for are those of reality and of contemporary life—those that film and other audiovisual media, along with musique concrète, use or re-create.

To describe sound objects in general, above all if we want to get beyond the classical instrumental notes, we must therefore have recourse to other concepts. Schaeffer proposed some novel ones that he dubbed *morphological criteria* (defined as *properties of the perceived sound object*) and that he reduced, initially, to seven. Among these will be found two of the

traditional parameters, albeit with broadened definitions. Thus, pitch becomes in Schaeffer's acoulogy a particular case of *mass* ("manner in which sound occupies the field of pitch"), which we have already encountered in the typology. The parameter of intensity is located within the criterion of *dynamic profile*, which designates the characteristic way in which a sound evolves—or not—in terms of intensity over its duration (particularly during the first seconds, that is, the moment of a sound's attack). As for timbre, it is basically broken up into three criteria: *harmonic timbre*, or the specific perception of the halo of harmonics surrounding a given sound; *grain*, or the microstructure of a sound's materiality, comparable to visual or tactile grain; and finally, *bearing* [*allure*], which generalizes the traditional idea of vibrato.

Within the framework of his morphology, Schaeffer sets aside cases where mass varies in the course of a sound's unfolding and reserves specific criteria for them (mass profile and melodic profile). With the unqualified term, he considers cases where mass is fixed. Five principal cases of mass are distinguished in the morphology:

- A sound the mass of which is a single fixed tonic is called a sound with tonic mass or simply a *tonic sound*.
- A sound the mass of which is a complex "bundle" of a certain thickness is called a *nodal sound* or is said to have nodal mass.
- A sound the mass of which is heard as a superimposition of clearly identifiable tonics (the case of chords in classical music) can be termed a *tonic group*.
- A sound the mass of which is heard as a superimposition of "knots" or, if you like, of "nodal sounds" that are distinct and distributed across several levels of the field of pitch can be termed, with respect to its mass, a *nodal group*.
- A sound in which the mass consists of superimposed "knots" as well as "tonics" is called a *splined sound*. This case is extremely common with industrial and household machines (where you make out tonic pitches alongside complex "bundles"), but also in many natural sounds and cooking sounds.

"Knots" and "nodal sounds" by definition cannot be localized in terms of pitch with the same precision that holds for tonic sounds. Likewise, the interval that separates a knot in the high register from one placed in a lower part of the range (to give a concrete example, two drops of rain impacting an umbrella) comes under the field of "color" and cannot be judged with the

same exactitude that allows us to say or to feel with respect to tonic sounds that we are dealing with a fifth, an octave, or a third.

But this is not a reason to aimlessly or heedlessly abandon the evaluation of complex sounds, as has almost always been done. It is here that Schaeffer proposes the quite simple but important concepts of site and caliber:

- The *site* of a sound, regardless of whether tonic or complex, is its location in the field of pitch perception. It is very high-pitched, high-pitched, medium high, medium, medium low, low, very low, and so forth, and differences in site between drops constitute what gets called rain's melody.
- The *caliber* of a sound in respect to its mass is its bulk in the field of pitch, that is, its thinness or thickness in terms of mass.

In theory, the caliber of a sound and its site are as different from one another as, in ground made up of juxtaposed geological layers, the thickness of a given layer and whether it is in close proximity to the surface or, on the contrary, deeply buried. In practice, because of the ear's "response curve" and its quite variable sensitivity to intervals and thicknesses depending on whether a sound is situated in the high, medium, or low register, it is fairly difficult to compare the calibers of two "knots" the sites of which may be located in very different zones of the pitch range. It is difficult, for example, to say if a given complex sound in the high register is as thick as, thicker than, or less thick than a given other in the medium or low register. On the other hand, for two sounds with very proximate sites, we can easily make such a judgment.

The second morphological criterion is *harmonic timbre*. This is the "more or less diffuse halo and in a general manner related qualities that seem associated to mass and allow for its characterization."[4] Quite an abstract definition, and fittingly specified by invoking the example of traditional instruments. The difference between a clarinet sound and a flute sound otherwise identical with regard to pitch, duration, and intensity—or again, between two vowels sung on the note—is essentially a difference in "harmonic timbre," and this harmonic timbre corresponds, on the plane of physics, to the characteristic array of harmonics above the fundamental. The Jew's harp, an instrument with worldwide distribution in one form or another, is characterized by the continuous and rapid variation of harmonic timbre (a well-known effect that is translated by the onomatopoeia "twang"). A given harmonic timbre may be qualified as more or less sullen, bright, biting, vital, and these qualifications are not arbitrary but correspond to the primary instances of the number and

disposition of harmonics. The harmonic timbre of a sound is easy to spot, to distinguish from its mass, and to qualify when tonic sounds are at stake. However, in the case of complex sounds—splined ones, for example—it appears too intermingled with the mass of a sound for clear identification and qualification. Nonetheless, we perceive very distinctly variations that are produced, for instance, while filling a container, and these variations are what guide ergo-auditory feedback. The first two morphological criteria concern sound mass; the next two—grain and bearing—concern material substance and microstructure at a detailed temporal scale.

Grain is the third morphological criterion. A sound's grain is the characteristic microstructure of a sonic material. In the case of instrumental sounds grain would be associated, for example, with the address of a bow, reed, or rolling timpani mallets. This quality of a sonic material—which not all sounds have, as opposed to mass—will be very quickly grasped by comparison with its visual equivalents (grain of a photo, of an observed surface) or with its tactile equivalents (grain of a touched surface). In particular, a grain can be characterized as more or less "rough" or "smooth." The bassoon or the alto saxophone in the lower part of their ranges, a bass voice, many animal growls or roars, a cat's purring, but also numerous sounds made by rubbing or scraping present us with characteristic grains. On the contrary, a "smooth" note made on a violin—smooth in any case for the auditor—or a telephone dial tone does not have a grain.

Bearing [*allure*] is the fourth morphological criterion. It is a light oscillation of the set of characteristics of a sound (pitch, intensity, etc.) that affects its sustainment. This criterion is in fact a generalization of the classical concept of vibrato. A cellist's vibrato or singer's vibrato are examples of bearing, but sounds of natural or electroacoustic provenance can be marked with regard to their sustainment by a characteristic bearing. From the point of view of time, bearing could be described as being more or less broad or dense; from the point of view of amplitude of variation, as more or less deep. Classical singers whose voices have aged will typically have a deep vibrato. They are said to "bleat." But in other vocal traditions this bleating is, on the contrary, a welcome effect. At the beginning of Bartók's String Quartet no. 4, the notes held by the instruments are at first indicated to be played *senza vibrato* (without vibrato) and subsequently *col vibrato*, and one gets the impression of an immobile sound that then begins to flow or of a flat and unmoving water surface that a wave sets aquiver. One of the great revolu-

tions in the interpretation of early and Baroque music these last twenty-five years was the abandonment of systematic vibrato for both the sung parts and the instruments—a vibrato that is preserved, on the other hand, when playing Romantic music, where it is obligatory. Just as impulses that come closer and closer together end up making an iterative sound and just as there exists a zone of indistinctness between them, a very tight (i.e., rapid) bearing "becomes" little by little a grain, a rugosity, and for certain sounds in Schaeffer's composition *Études aux allures* for example, we are on the fringe.

The fifth morphological criterion that Schaeffer proposed, the *dynamic criterion*, is fairly heterogeneous. It aims to gather everything that concerns the perception of variations in sound intensity, in particular at the level of a sound's attack, that is, at its very beginning. In this way we can distinguish among attacks that are abrupt, stiff, soft, dull, gentle, and so forth, as a function of the gradient of appearance and decay of a sound. For example, when you play a high G on a classical guitar—that is, a minor third above the high E string—and you attack the note close to the sound hole, you get a sound the attack of which is harder and more abrupt than when you pluck the same string close to the fretboard. Classical and flamenco guitarists constantly change tone color, and they do so in particular by employing differences in stiffness of attack that are mainly produced by using either the flesh of the thumb or the nail, but also by plucking the string in different spots. The experiments in "interrupted attack" that Pierre Schaeffer carried out using fixed sounds have shown that a sound's attack is above all perceived *after* the rest of the sound, that is to say, after the gradient of dynamic decay. For example, a very high-pitched note on a piano the beginning of which is excised will be perceived as having a stiff attack because its gradient of dynamic decay is relatively accentuated, whereas in the case of a low note on the same instrument, with a dynamic gradient at first more rapid and then more gradual (a longer resonance), removing the attack makes the sound lose its specific quality of being a piano sound. You will notice that Schaeffer only considers the dynamic criterion in cases where a sound's intensity changes in the course of its unfolding and not when it is, in statistical terms, fixed. This is because intensity as an absolute sound value is strictly dependent on listening conditions—position of the auditor in relation to the source, adjustment of the listening system if we are talking about fixed sounds heard via loudspeaker—whereas variation in a sound's intensity, at whatever level you happen to be listening, preserves its characteristic shape.

The last two Schaefferian criteria are *melodic profile* and *mass profile*, and they can seem mysterious. Like the dynamic criterion, these are also criteria of temporal variation. *Melodic profile* applies to the figure that an unfolding sound delineates within a range of pitches, that is to say, when its mass as a whole travels through the field of pitch and undulates there, outlining characteristic contours, whether its variations in site are discontinuous and scalar (the case with traditional melody) or continuous, serpentine, made of gliding sounds. This criterion must be differentiated from *mass profile*, with which it is easily confused. The latter applies, in fact, to the figure delineated by a sound the mass of which undergoes variations in thickness that are internal to the sound itself.

Where the Theory of the Sound Object Is "Lacking"

Schaeffer's classification is often disputed because of its incapacity to provide a clear place for extreme cases and to resolve conclusively certain decision problems. Is a given sound tonic or complex? Yes or no? Are we dealing with an iterative sound or a continuous granular sound? Yes or no? Is this sound too long to be an impulse? And so forth. In the world of language—in the sense of the object of linguistics—and its differential system, the very logic of the system underwrites all-or-nothing distinctions, which toggle from one meaning to another. If a phoneme is ambiguous, we must choose between bake and rake, between reason and season. But with the descriptive approach, we are not in a system of the sort. There is a tendency today to think that a distinction that is not valid for all cases and that doesn't always allow for a decisive answer is worthless, and this leads to testing its validity by countering with limit cases. I am thinking of that student in one of my courses who, with a healthy critical attitude, tried to test Schaeffer's distinction between the site and caliber of complex sounds by setting a trap for it. He submitted "the" limit case par excellence: that of complex sound in an unadulterated form where the caliber is total, filling the entire field of perceivable pitches—the acoustician's celebrated "masking white noise," which you can experience next to a very powerful waterfall—such that its site would appear to be annulled. To his mind, this should have obliged us to conclude that, since it does not hold for this extreme case, the distinction between site and caliber is not valid. To which the response must be that, in this case, the extreme only represents a particular instance of confusion of site and caliber, certainly a curiosity, if you like, but an instance that for the

sound "naturalist" is not necessarily more interesting than a more common species. In the animal kingdom, the famous platypus, an oviparous mammal that is so hard to classify, is not more interesting than a rabbit. The overestimation of so-called extreme cases is often a way to evade the difficulties of observation and description. Further, I would mark the propensity to apply the word "extreme" itself to sound. After all, what we call the extremely high pitch range with regard to a sound's mass is not a more curious or interesting case than the so-called medium range. It's as if the borders of a country or of a surface area were considered more interesting than the interior or than the general layout . . .

An important aspect of Schaeffer's music theory is that the morphological criteria are articulated with the notion of three perceptual fields (pitch, duration, and intensity). It is this three-dimensional model, which Schaeffer had already put forward in the 1950s, that we must closely examine not only to question it but also to underline where it is of interest. Let me say right off the bat that Schaeffer revises the model radically when he lays down the hypothesis with respect to pitch that there is single field that is divided into two heterogeneous subfields, depending on whether one is dealing with steady tonic sounds or with sounds that are either complex or variable. The first subfield can be termed *harmonic*. It is scalar, discrete in the linguistic sense of the word, and lends itself to precise location and perception of intervals. The majority of traditional musical systems come within its scope. Schaeffer calls the second subfield of pitch, that of complex or variable sounds, *chromatic* [*coloré*] or *plastic*. It lends itself to more vague evaluations, to a more approximate and comparative apprehension, and does not provide the means of locating an equivalent of scales or precise degrees. The mistake made in much contemporary music would have been to claim to address the ears from the harmonic field (by writing precise notes on paper) all the while in fact addressing the "chromatic" ear for auditory effects, since these compact pitch clusters or continuous variations do not provide a purchase for perceptions of tightly calibrated intervals. It seems to me that this way of putting the matter is still valid.

The *Traité des objets musicaux* thus puts forward three perceptual fields: the double field of mass (linked to frequency), which would extend from the lowest audible frequencies to the highest; the field of intensity (linked to a signal's amplitude), which would extend from the weakest possible sound to the unbearable; and the field of duration (linked to a phenomenon's timing), extending from sounds too short to be perceived to those beyond measure.

But does this give us a three-dimensional sound? Certainly devices that analyze or synthesize sound waves know of no others, but what about on the plane of perceived sound? In that case, there are many more fields, or rather the concept of field is no longer relevant. A preferable one would be, for example, texture. Let me state immediately that it does not seem to me possible to describe sound in the form of a voluminous object captured in a system of three-dimensional coordinates, as, under Abraham Moles's influence, there was a tendency to think sound, and as Schaeffer, notwithstanding that he was the most mistrustful of this model, still dreamed of in the 1960s.[5] A piano note, for instance, is not a matter of a pitch coordinate combined with coordinates for intensity and linked to harmonic coordinates. Too many different components come into play. Variations in intensity, for example, produce a specific perception of attack that is something other, perceptually speaking, than a curve marked out by the coordinates of time and intensity. Rather, it becomes matter.

The notion of field is itself a trap. It presupposes that what is found within a given field has a kind of homogeneity that can be represented as a continuum of variations, degrees, and nuances. But for duration and intensity, for example, this is not at all the case. It's as if one wanted to situate our perception of temperature within a homogeneous field of degrees Celsius or Fahrenheit, whereas cold and hot depend on contextual factors such as thermal shocks (hot and cold showers), acclimatization, combination with nonthermal criteria, and so forth. I would go so far as to take issue with the notion of even applying the concept of field to anything that is not mass or pitch—thus to phenomena linked to intensity and duration. For human beings, the space of pitch is a finite one, the limits of which are localizable. As for intensity, the boundaries are much vaguer. Thus, the experience of the "weakest sound" that we are capable of perceiving never happens because of the permanent background noise in our living spaces, modes of transit, and workplaces that prevents us from hearing it. Before machines and automobile traffic, there was the forest, the sea, the wind, lashing rains, and so on. There is no field for duration either, because beyond a certain temporal size limit—a few seconds—we no longer totalize duration as such. It is the development that we attend within a given duration, as it unfolds, that matters.

Finally, as Schaeffer stated, there is no homogeneous field of pitch. Yet are the two subfields of pitch that he distinguishes—the harmonic and the chromatic—imbricated within a single field or radically heterogeneous? On

the one hand, they constitute, if you like, a single field. If we expose someone to a bass tonic sound followed by a high-pitched sound with complex mass, he or she will clearly hear the first as lower than the second and vice versa. Thus, from a certain perspective, there is *one* pitch field. The borders of this hypothetical unified field, however, in which two subfields are superimposed, are not distinct. We can even say that at the two perceptual extremes, there are two "cross-fades": one that has to do with the shift from a precise perception of pitch to a perception of complex mass; the other with the shift from a sonic sensation that enters via the "auditory window" to one that felt bodily via covibration:

> *Gradation from perception of tonic pitch to perception of complex mass.* To hear the perception of precise pitch fade away and perceive that you are in a different territory, all you have to do is play on a piano the bottom octave by descending to the lowest note on the keyboard and, at the other extreme, ascending the last six degrees up to the last note in the high register.
>
> *Supplementary gradation, with low-pitched sounds, from the perception of pitch or mass (progressively accompanied by covibration) to covibration alone.* In other words, aural perception fades at the same time that vibratory sensation in the body asserts itself. This only holds for sounds at high volumes. Bass sounds in dance music are often situated in this zone of gradation.

Another matter then arises of criteria knowingly or unconsciously—it makes little difference—left out of Schaeffer's descriptive system. First and foremost, *space* comes to mind. Just as he did not take into account the apparent distance from the real or imaginary sound source, Schaeffer in his theory does not bring up the possible presence of reverberation around the sound, and this reveals his implicit choice, which is to define the sound object as *that which remains constant in a sound, beyond variations of its global intensity, its distance from the ear, its resonance in a space, and its movement in that space*—beyond, that is, all data that can be perceived as contingent variables, dependent either on our relation to a sound or on that sound's milieu. On the contrary, for Schaeffer qualities relating to "mass," either constant or variable, are the values that are absolutely constitutive of sound (which brings up the particular problem of the Doppler effect, which contradicts our usual feeling with regard to sounds, namely, that their pitch is independent of our

location in relation to their source). Likewise, the "dynamic profile"—at least when it is not linked to a change in the apparent distance of a sound—is considered by him as an absolute dimension of the object, as opposed to its global intensity and spatial envelope.

In sum, the sound object according to Schaeffer is defined as *outside of space*. This is a choice that may appear all the more paradoxical insofar as it was from sounds affixed to a medium, in which case sound can be the carrier of a particular space that is locked up with it on the magnetic tape, that the author of the *Traité des objets musicaux* was able to construct the sound object. That Schaeffer did not take into account the spatial dimension of sounds bears ample witness that he decided to forget that sound is "fixed," even when that fixing remains his only concrete guarantee that he is dealing with the same sound object and his only means of describing it and observing it in the mode of reduced listening. Such are the detours on the road of discovery.

Nevertheless, the two major—and deliberate—limitations of the concept of Schaeffer's sound object in relation to a more general scheme—which is, moreover, not his scheme—are as follows. First, *Schaeffer implicitly links the sound object to an ideal of "good form"*: a distinctly contoured shape, tidily delimited in time. This does not correspond to the characteristics of many sounds employed in audiovisual media, nor even in music, that have a complex shape or an extended duration. Second, *it remains defined from a naturalistic perspective*. In other words, he leaves aside the fact that the object is only repeatable, observable, and definable by dint of a recording medium and that it thus exists by being fixed. In fact, Schaeffer's sound object is supposed to correspond to the laws of a logical and total acoustic unfolding; it is supposed to be born or burst forth, then unfold and decay "naturally," in accordance with an acoustic model, whereas in fact it is only accessible as an object of observation insofar as the technical conditions, by which it is fixed, make it escape these acoustic laws and allow for the generation, by a simple process of sampling, of an object like any other. Notwithstanding, the immense interest of Schaeffer's sound object, in my opinion, is that it does not hide its contradictions, putting front and center the entire problem of the dialectics of listening. This is particularly the case when it bluntly asks about a matter that other, be they earlier or later, conceptual schemes neglect: about the *temporal limits* of that sound object [*objet sonore*] or *sound thing* [*objet-son*], which make it so it is not the same to listen for three seconds or for twenty, thirty seconds or three minutes and more.

Toward a Dynamic Conception? Energizing Logics

The gaps in Schaeffer's music theory, thanks to the very empty spaces that they leave behind—and that they do not hide—within an overarching conceptualization that is, moreover, replete and grand, demonstrate the necessity of finding a way to speak about sounds while taking into account what nourishes them over time, that is to say, the laws, the "energizing logics," the "processes" that animate them. It was up to the musique concrète composer François Bayle—from whom the term "energizing logics" is borrowed and who made particular reference to Paul Klee in this regard—to come up with the idea of applying to sounds this dynamic conception, which the devotees of instrumental music could only do with difficulty since orchestral music, in spite of the richness of its timbral combinations, is enclosed within certain mechanical limitations with respect to the active unfolding of sound, particularly concerning the liveliness of spatial and dynamic variations.

Anyone who says "active" implies the ideas of force and energy, and sounds can be listened to and manipulated as phenomena that are energetic and in motion, not as objects ordered and stacked on the shelves of time. This is also why it was necessary to put back into question the term "sound object" that Schaeffer successfully put forward in order to characterize the object perceived by the subject in the mode of reduced listening. It does lend itself to confusion insofar as it seems to designate this object as a sort of sphere that listening grasps, if I may put it this way, in the blink of an ear, whereas sound, as I will point out later, unfolds and manifests itself in time, and is a vital process, an active energy. It was thus that Bayle arrived at the idea of considering sound as energy in motion and of classifying the concatenated relations among sounds not only as abstract comparative relations—as differences of degree on a scale—but also as active relations of transmission, exchange, reaction, or energetic conflict.

Let us take, for example, the case of two sound sequences that, while different, are both instances of incremental change or, to put it another way, they both have an intensity profile that follows a crescendo/decrescendo pattern. What I have in mind is the classic sequence of a "flipped sound" (a reversed percussive-resonance sound) with a percussive-resonance sound going in the normal direction. The tenth movement of my musique concrète composition *Vingt-quatre préludes à la vie (Danse de l'ombre)* is mainly built out of a schema of the sort. If you listen to two different incremental sounds put together by editing, you will first of all perceive in each instance

that the active relation of "energy transmission" between them is more pregnant than their difference in terms of color, timbre, and pitch—as if the energy of the first had been poured into the second and that in so doing a perfect cycle of birth-development-reabsorption had been created. Next, you will identify the "energy face" of the incremental sound as different incarnations of the same in each of the two instances. Put differently: you will perceive that what is at stake is a typical schema that can be abstracted from the myriad forms in which it can be found. It would appear, however, that such schemata are limited in number, not because they are drawn in this way—like whimsical scribbles traced by the hand of nature or a composer or a jazz musician—but rather with direct reference to natural and physiological models. That is to say, they are the sonic translation—or, better, they manifest the *existence* on the sonic plane—of more general processes that we have assimilated in the course of our human experience.

There's No Getting Around Schaeffer

Whether or not you share his views on music, a transit through Schaeffer remains ultimately impossible to avoid. For a long time, I had my own reservations about the descriptive hypotheses in the *Traité des objets musicaux*, and I expressed my objections in various articles, all the while steadfastly and with an absolute commitment to neutrality carrying on my analysis of the work along with a description and clarification of Schaeffer's concept in order to write my own *Guide des objets sonores* [*Guide to Sound Objects*]. It seemed to me at the time, as it did to many another, that the notion of sound object was a utopia and that it was folly to try to make the roiling world of sounds, indeterminate with regard to duration, fit into the temporally closed frame of the sound object. Today, what strikes me as interesting is Schaeffer's dogged pursuit of the problem of sound as *object*, starting from the notion of closed temporal form. Further, a portion of the sonic universe can be grasped and described quite well with these concepts, and to renounce such an enormous gain on the pretext that they cannot be generalized to all sounds and that accordingly nothing has been achieved would be idiotic. Once again we see the ruinous cost of insisting on the "all or nothing," which would have us believe that since Schaeffer's system does not allow us to classify all sounds and to resolve every problem, that learning it is useless. The great virtue of his approach, however, is that it is structured and that it marks the outlines of its own limitations.

Since the abandonment of Schaeffer's approach, there has been regression and stagnation on an important topic: the question of time. On the matter—the crucial matter—of the *temporal frame* of listening, all recent research has hit a roadblock. That this has happened should come as no surprise, since it is tricky. At the same time, there has been regression on all the other fronts, as if everything were connected. Just because contemporary composers, of whatever aesthetic stripe, enjoy working with sounds of relatively long duration does not mean that the study of listening in general need comply with this tendency. It is no more up to the musical aesthetic currently in vogue to dictate lines of research than it is up to research to impose directions for aesthetics. And this would be so even if we could predict that one day, by a simple return swing of the pendulum and the need to construct the terrain anew, composers will once again look into Schaeffer's sound object. If that were to happen, perhaps forms of music would come into fashion made up of sounds of limited duration, following one another in a very discontinuous manner—in short, the opposite of contemporary forms of music, where more often than not everything is happily continuous and indeterminate with respect to duration and shape. Yet we are not obligated to wait for such a change in direction or fashion to consider the problem. As for film, it gladly makes use of vital and "shaped" sounds, for instance as effects in action movies.

Before Schaeffer, if we compare sound perception to visual perception, the latter seems in effect dedicated to the extremes. We know that for the specific category of "tonic" sounds, it in fact revealed a maniacal exactitude, whereas for the family of complex sounds—which fall outside of the former category—it remained completely in the fog. The musician caste did little to remedy this dislocation between a hyperprecise perception of "notes" and an apparently blurred perception of "noises." But when Schaeffer proposed recourse to the concepts of "site" and "caliber" to assess the mass of "complex" sounds, which would be evaluated in terms of "register" and "thickness," respectively, he eliminated this dislocation along with perception in all-or-nothing terms. Everything took place at the time as if sound perception convinced itself that it saw with extraordinary clarity for a certain zone of attention—the sounds of language and those of music—and with extreme vagueness for the remainder. In Schaeffer's undertaking there is a fine project: to reveal to auditory perception, faced with the more general apprehension of the sonic world, its own subtlety, which it little understands and yet possesses.

Likewise, if the visual world seems to present itself perceptually speaking as a state of continuity, where all objects correspond roughly to the same perceptual criteria with regard to their structure, the sonic world was, before Schaeffer, treated rather as a state of *discontinuity*, from which emerged, in the midst of a more or less chaotic murmur, particularly distinct and chiseled objects. The latter are the object of verbal and musical communication, to which must be added certain—very circumscribed—machine and animal sounds. Whereas in fact the ear when suitably aroused by the practice of "reduced listening" is capable of—make no mistake about it—scaling back these extremes and bringing about a more differentiated and polished perception of phenomena until then experienced as muddled. It makes us apprehend the sonic world as well as a state of continuity in which sounds, be they music, speech, or noises, fit into forms and general profiles that transcend their belonging to one of these categories. The simple proposal of the ordinary term "impulse" to place into the same family all those sounds—a pizzicato on a violin, a monosyllable in language, the blow of a hammer—that occupy listening time in a punctual manner is an achievement. And it is an achievement if only because it is a *word* and not a notational symbol. In fact, unlike a notational symbol, which closes in on itself, the word places us back in the world of language. It thereby always marks out where it is wanting and so urges us endlessly forward. This is what Schaeffer demonstrated, and this work of humanizing listening and reducing its extremes, which he began by trusting not to notation but to language, seems to me an important legacy to pursue.

Acoulogical Proposals

In a domain as complex and, above all, as new, it is neither alone and over the course of a few years nor within the necessarily limiting framework of a work of this sort that responses to so many questions can be given. I will confine myself here to presenting my own research paths in the hope that these can be taken up and deepened by collaborative efforts.

My first proposal is to study sound within the very limits of what we can call its identity: starting with which variable does a sound object cease to be "the same"? With Schaeffer, it seems a given that to study a fixed sound means studying and listening to the same sample embedded in a medium, and this approach, which I have applied, yields abundant results, particularly when accompanied by attempts at implementation and when it thus

makes the round-trip journey between doing and hearing and describing (verbally). In this regard, let me emphasize that when I assign the production of isolated sounds in my classes, I clearly specify that making music is not at stake—that you could quite easily compose music in tandem, but that the goal of the exercise is first of all to employ and engage your perception and familiarity. Of course, listening experiments are never carried out alone. They call for collaborative work. But each of the individuals in the group can create music on the side, and there is nothing to stop them from doing so either singly or severally. It is simply that an exercise in listening and observation in general is distorted if we seek immediately to cash it in for aesthetic implementation.

Having said that, while working on fixed sound objects, it has seemed to me that they offer a bit of resistance to observation and that the concept of object is not completely identical with that of a sound embedded in a medium and played in the same listening conditions. Taking our cue from Merleau-Ponty when he discusses visual perception but also the idea of an object generally speaking, we might put forward in this regard a hypothesis: the notion of the object's *constancy*. In fact, there is for consciousness no possible or conceivable object unless that object is perceived as the *same* across the *different* acts of apprehension that enable it to be peeled away from the immediate perception that that consciousness has of it at a given instant, like a sheet of paper that remains white whether viewed under an electric lamp, in the shade, or in full sunlight. As Merleau-Ponty puts it: "To begin with, a thing has its size and its shape beneath perspectival variations, which are merely apparent. We do not attribute these appearances to the object, they are an accident of our relations with the object and they do not concern the object itself."[6] This law of constancy poses a peculiar problem when what we are dealing with is an incorporeal object like the sound object. If you listen to a recorded snippet the volume level of which alone is varied with a turn of the dial, can we still believe that we are nevertheless dealing with the same sound object? What I am thus suggesting, as far as the law of constancy is concerned, is that listening experiments be conducted. These experiments will bear not only on distinctions between sound objects and the criteria that they sustain—since these have already been carried out, however incompletely—but also on the *conditions of variability* within which a sound object can still be considered as nonetheless the *same*.

Second, are sound object and reduced listening obligatory correlatives and inseparable from one another? Can we still use the term "sound object"

while submitting it to different modes of listening (causal/figurative and codal)? In his *Traité des object musicaux*, Schaeffer welds them together and has them refer to one another in a circular fashion. Yet, while it is true that reduced listening can be put forward as that which delimits sound objects and carves them out of the auditory field, why would they—once carved out, isolated, and located at the level of reduced listening—not be available for study not only with respect to their morphological qualities but also in terms of the causal associations that they elicit? Of course, in so doing we would still need to distinguish the cause figured forth, heard, or suggested by the sound from the material, historical, and factual cause or causal complex. By defining the sound object as the correlate of reduced listening, Schaeffer made acoulogy take the necessary giant step forward. He enabled acoulogy by peeling sound away from its cause. All the same, he was apparently unable to do so without first depriving the sound object of a portion of its characteristics at the same moment that he formulated it. It is now time to redefine sound perception as that which, while no longer relating to a real cause—but still having a figurative/causal dimension—marks out an object serving as a medium for various types of listening.

Third, Schaeffer's own restrictive decision can be explained by his project, which was to lay the foundations for music of the "greatest possible inclusivity," albeit a nonfigurative music. The term "sound object" expresses something doubly limited: limited in time as well as limited to reduced listening. But we must provide a designation for sound insofar as we are also interested in its cause, in what it figures forth, in its effects, and as a medium for all sorts of listening, and I do not want to reclaim the expression "sound object" and thus risk distorting our understanding of Schaeffer's approach. Out of respect for Schaeffer and his coinage, my opening proposal would be to shift the terminology and to call sound as perceived *auditum* (the neuter past participle of the Latin verb *audire* and meaning "something heard"). By and large, I would cede the word "sound" to technicians and acousticians, as well as to everyday usage, which I would not claim to reform. Whereas the "sound object," as Schaeffer defines it and the conception of which must be maintained, assumes something that can be totalized as an object of perception, carved out of the sonic flux, and therefore of limited duration, *auditum* is a word willfully and consciously indeterminate with respect to the length of time that a phenomenon takes up. Furthermore, it can be the subject of reduced listening or of causal and/or figurative listening, and which is of no matter. I judge it necessary, in effect, to add a term that, with regard

to duration, prejudges neither the shape nor the complexity of the heard phenomenon.

The *auditum* is sound as perceived and cannot possibly be confused either with the real source (or the causal complex that constitutes its source) or with the vibratory phenomena studied by the discipline called "acoustics." Unlike Schaeffer's sound object, the *auditum is subject to all modes of listening*—reduced, causal, figurative, semantic, which make up different, at once linked and independent, levels of apprehension—knowing that it is helpful to distinguish among these modes of listening that take aim at the *auditum* and for which it is the foundation. Unlike François Bayle's "i-sound," the *auditum* can just as well be an ephemeral sound produced at a moment in time and without being recorded as a fixed sound. But in the former case, needless to say, this *auditum* in situ cannot be precisely observed, which often does not prevent it from being recorded somewhere in memory.

Ten Reasons Why Sound Is Difficult to Treat Like an Object

But am I sure that my *auditum* will find the way to become what the sound object that Schaeffer put forward within such precise conditions and with such a clear definition has yet to officially become in the eyes of the scientific and artistic community: an object? Even if it means belaboring the point or sounding like a broken record, I am going to go through all the reasons evoked in the course of this work that sound might be incapable of "reification," all the while being open to a more exact description and apprehension. Consider the situation: We find ourselves dealing with a perceptual phenomenon—as we do with "sound"—to which the same noun is given to the physical cause that gives rise to the former (in French, the word for "sound" in effect designates both the physical vibration and the heard object), an extraordinary synonymy that becomes the source of predictable confusions. We notice that the coagulation of such different levels into a single word will be found in several languages and is not therefore the endowment of a particular culture. And we see the resistance—be it in the form of indifference or of open hostility—to attempts such as Schaeffer's to remove this "interdisciplinary misunderstanding." Under such circumstances we must doubtless say to ourselves that more is at stake than laziness or ignorance but really and truly a cultural fact in itself worthy of interest—and, further, that sound is this confusion of which, as such, acoulogy must speak. I began with "science," namely acoustics. I must now start over with

language itself. If sound is an object, it makes its initial appearance in our culture as an object of language, as a shattered object, indeed as an impossible object, hard to reify, and this for more than one reason. Here are ten of them:

1. *Because, if we trust to language, sound is divided between the obverse of a "cause" and the reverse of an "effect."* In this book I have used the word "sound" in two quite opposing senses, sliding between one and the other, and in a way authorized a usage that must now be called into question. From time immemorial, many authors have noticed the problem, but they have done nothing about it, respecting this linguistic usage as if a sort of sacrosanct legacy. In Albert Lavignac's *Encyclopédie de la musique et dictionnaire du conservatoire* (originally published in 1913) we read:

> Without a doubt, sound, that is, sonic sensation, does not exist outside of us. There are only mechanical phenomena that, transmitted to the auditory nerve, give rise to the sensation, but these are not the sensation. By an improper extension of the word, however, "sound" gets used to denote the objective phenomenon that gives rise to the sensation. Thus we may speak of the propagation of sound or of its reflection. In reality, these expressions are meaningless, and sound no more propagates nor is reflected than any other sensation might be. . . . [7]

It could not be better put, and yet, just afterward, the author decides that "there is no disadvantage in using the word 'sound' to signify sometimes the sonic sensation and sometimes the objective phenomenon that causes the sensation, as long as no confusion is thereby created."[8]

And yet, disadvantages there are, of which the most evident is that the confusion encased in the word's usage takes up mental residence and the existence of institutions, of theories, of speculations mired in this confusion and based on it make it such that, having been granted the status of an established fact, it is not perceived as such. Imagine the incoherencies that would ensue if one were to write books about the image and about light that calmly authorized the use of the same word for both a physical phenomenon and a perception. Among others, the adjective "subjective," which is often applied to sound in the sense of *auditum*, leads to considering the sensation as secondary and random in relation to the physical aspect of the phenomenon. In this case, it would be like treating an object's or a painting's colors as subjective and random, variable for each individual, and thus unworthy of study on the grounds that they are likewise the psycho-

logical effect of vibratory physical phenomena. Still, when in 1994 Roberto Casati and Jérôme Dokic ask, "Can two or more sounds be located in the same place at the same time?," adding, "The example that comes to mind immediately is that of chords: several sounds can resonate together in the same spatiotemporal area," it is obvious that the most heterogeneous meanings of the word "sound" collide in their formulation of the question.[9] In fact, "several sounds" means notes with several audible pitches (which can be individually and simultaneously heard and identified) as well as several sound waves, once called by the name "verberation," a word forsaken but worthy of rehabilitation with honor, and defined as "vibration of the air that produces sound."[10]

For their part, Stevens and Warshofsky return to the canonical question: "If a tree falls in the forest . . . and no one is there to hear it, will there be a sound?" After having recalled the physical definition of sound—"Sound is an organized movement of molecules caused by a vibrating body in some medium (water, air, rock or whatever)"—and the so-called philosophical definition—"Sound is a sensation . . . a sensory experience"—they come to their own conclusion by putting these two assertions back to back: "This question still puzzles people to this day—and puzzles them to no purpose. It confuses a cause (a physical vibration of some material thing) with an effect (a physiological sensation in an animal brain). And which of the two is sound? Both."[11] The authors, who have just proven that there are two different things, could have gone on to say that the entire problem comes from applying the same term to both. Instead of drawing out the consequences, they ratify the linguistic confusion and even turn it into a law (which word "must we" use, to cite them), whereas all the components are there in what they write to make it understood that the problem is one of words. Perhaps this comes from sound being lived as that which ties us both to the outside world and to the inner world, often revealing to us the inside of objects, of opaque containers—among which the human body for doctors trained in auscultation. There would then be an ideological need to not divide and rather to preserve intact, via the preservation of a single word, this myth of sound as a sort of Garden of Eden of sensation or as a point of transfer, linking every dimension.

2. *Because sound is torn, like the body of Orpheus, between disparate disciplines*. According to myth, Orpheus, master of sounds and tamer of winds, was torn apart by the Thracian women, furious that he preferred dead Eurydice to them. The word "sound" itself, unsatisfactory for signifying

so many different things on so many distinct levels of reality, is put forward as *one* only to be immediately sundered into several disciplines—acoustics, psychoacoustics, phonetics, sound ecology—that are believed complementary, whereas they remain mutually ignorant, and believed standardized, whereas their scientific validity is, for the majority among them, poorly established because lacking a clearly delimited field (I am thinking, for example, of psychoacoustics). In mathematics, the overall territory is well enough defined and established, and it does not look as if there are misunderstandings at the international level over what geometry or set theory is about. When it comes to sound, heterogeneity rules supreme. For the time being, we will need to take stock of those disciplines that exist and see what they are about. But the problem remains that all of these disciplines lead a disorderly coexistence with one another, without real standing.

Acoustic ecology, for example, a specialization out of Canada fathered by R. Murray Schafer, is not a clearly defined field. In that touchstone text of his, *The Soundscape*, we find technical notions, descriptions of devices, musical references, remarks about daily life, and original concepts. The omnium-gatherum aspect of many books on the topic is typical, and my attempt here at *An Acoulogical Treatise* does not depart from the tradition. It is just that I am not presenting this miscellany as anything other than what it is. Acoustics in particular is a domain that is as poorly defined as would optics be if the latter dealt with the propagation of light rays and their physical nature as well as the recognition of shapes by the eye. If you set about analyzing visible phenomena as effects of luminous phenomena, you would never manage. You would quickly realize that vision gathers into a single "effect"—note the quotation marks—phenomena that are from the point of view of physics perfectly divergent.

One of Pierre Schaeffer's many virtues was to have questioned the—false—continuity assumed to hold between various levels: "Without going back to its origins, we can affirm that in optics zones as distinct as the study of light, the study of light sources, the study of illuminated bodies, the study of vision, the study of perspective, and so forth, are not conflated. Does anyone make such distinctions when it comes to acoustics?"[12] Pondering the reason for such confusion, the author opines: "It is because Nature, contrary to what happens with the eye and with light, seems to have gathered up and crumpled everything together, as much in the world of physics as in the worlds of physiology and psychology, as far as sound and the ear go."[13] This crumpling together of which Schaeffer speaks that masks the radical

disparity of levels is caused by an apparent continuity of scale between the materiality of sound waves (of which the lowest frequencies, from 30 to 40 Hz, are visible) and the perception that we have of them. In this context, it is not only a matter of setting up bridges but also of *challenging the very geographic figuration that we make of the matter*.

3. *Because sound sits on the edge between order and chaos*. The sound field appears divided, cleft, indeed sharply hierarchized by an important difference: the difference between sounds with precise pitch, with tonic mass to take up Schaeffer's term again—sounds that are often called "musical"—and sounds without a precisely localizable pitch, with complex mass as Schaeffer puts it—often called "noises." The former tend to stand out as more privileged than the latter. Thus, in the visual domain there seems to be relative continuity between strong forms and weak forms, leading from a perfect circle to one that is a bit uneven or crushed, and thence to ovals and to other composite forms. As for sound, however, sonic perception would be subject to jumps, to spots of turbulence, so to speak, which shunt us from one dimension into another—from the scalar *discontinuity* of tonic pitches to the *continuity* of complex masses (without precise pitch) or of glissandi.

For the ear, the Tarpeian Rock, from which convicts in Rome were flung, is never far from the Capitol, the place of victory. Thus, a wrong note is not the most distant from the one that ought to be heard, but to the contrary, the closest: a minor-second interval or, if you prefer, two notes separated by a half tone (for instance, D-flat and C natural), grates more than a minor seventh (C and B-flat). Whereas for the eye, a somewhat uneven square, where the parallel sides diverge slightly, does not give the impression "That's no longer it at all," a note right next to the required one produces an upheaval—sometimes a veritable physical distress. Musical sound is thus often at the tipping point, at the extreme, at the all-or-nothing between order and chaos. Likewise, two visual shapes can cohabitate or be superimposed in the same space while remaining clearly perceptible. But let's play two tunes in different keys at the same time and see what ensues: a shivaree. From such a shivaree, an entire aesthetic was derived at the beginning of the twentieth century—consider Stravinsky's wonderful *Petrushka*, composed in 1911—in which tonalities are merrily superimposed. We might also think of the numerous carnival sequences in films from the thirties, where music coming from various stands overlaps. But we must not forget either that in these musical pieces and films the chaotic superimposition effect is always measured out in doses.

Such toppling moments also lead an invisible existence in classical musical scores: depending on the instrument and above all on the tempo of the execution, the same signs—for example, a string of sixteenth notes—can correspond to radically different effects. Isolated "impulses," such as strikes on a drum made at very discrete intervals, turn into an "iterative" sound as they are sped up (beats struck according to a tight rhythm but still allowing the impulses to be perceived as distinct). With further acceleration they become a "granular" continuous sound (beats struck with such a rapid rhythm that the impulses meld). Here again, qualitative jumps are created, and we find ourselves back at the perennial question of the continuous and discontinuous. Obviously, the difference between the way in which we approach this question with regard to the visual and what happens with the sonic is that in the former instance everyone is aware that it is a matter of distance or of backing up. We are aware that what is at stake with the image—thanks to the discriminating power of the eye—can be distinguished from what is at stake with the object seen. We know that dots in proximity to one another will meld when seen at a certain distance. On the other hand, with sound the leap between from the quantitative to the qualitative takes place in time and thus *without the possibility of perceptual distancing*.

4. *Because of the propensity that certain sonic characteristics have for monopolizing perception to the detriment of others*. Over several astounding pages of his *Conversations with Calypso*, Alfred Döblin speaks of that tendency of many musical pieces of being constructed around a single "king sound," for which other sounds function as the territory over which it reigns.[14] So true is this that the great composer Arnold Schoenberg had to build an entire musical system from scratch—the system of serial dodecophony—based solely on the idea of preventing an isolated sound—in this case, the pitch determining the key—from becoming "king" and serving as the pivotal note, attractor, and landmark. It is revealing that in Western music the way in which we identify a work is by reference to a crucial note: the fundamental of the primary key, as in César Franck's Symphony in D minor or Chopin's Prelude in E minor. Striking too is the way in which, even outside of music, a principal note (with respect to pitch) and a basic rhythm (with respect to time) structure perception around them much more markedly than in the visual domain. This is what enables phenomena of attraction, scalar play, traditional Indian music, and so on.

This propensity for one sonic feature to dominate the rest distracts attentive observation from the various features that make up a sound. For example,

the researcher Robert Francès in his famous treatise stressed what he called "melodic hyper-audition," which is the tendency to perceive higher notes as "figure" and lower notes as "ground."[15] It is true, however, that in his experiment musical examples were used the very aesthetic of which assumes this hyperaudition of high notes. The figure-ground relation, specifies Francès, "is not an immutable given of bodily organization or of consciousness."[16] This tendency that certain sonic features have of pulling the listening blanket to their side of the bed, if I may so put it, entails the frequent identification of a sound with the dominant quality that it mediates. The result is that we often find ourselves calling a sound by its salient quality—the one that, in a given context, stands out from all the others. Thus we say "a D" for a sound with a pitch of D, an eighth note for a sound wherein time is the dominant aspect; we name a rhythm for a sonic process in which the rhythmic scheme stands out, and so forth. More than in the visual universe, therefore, *sound is perceived as the carrier of a value* (the absolute value of pitch or the differential value of phonemes) *that, once it has stood out as a component of a discourse* (as a phoneme in the case of speech; as the pitch of a note in the case of a melody), *tends to relegate the other features of a sound to the rank of supporting role, platform, vehicle, coloration, or perceptual remainder*. It is this remainder that today gets adorned with every quality or reified, but that we refuse to analyze and concerning which we are attached to preserving the indeterminateness—synonymous with plenitude—intact.

5. *Because sound for the most part consists of events*. Jean-Jacques Rousseau had already put it thus: "Colors are the adornment of inanimate objects. All matter is colored. But sounds announce movement. The voice announces a feeling being. It is only animated bodies that sing."[17] In fact, sound not only is the result of movement but also very often itself is in a state of change. Rare are those sounds both permanent (without interruption or decay) and stable (without variation, even periodic variation). When we have dealings with a sound that addresses us with these two characteristics, it seems as though we grant it a special place. The regularity, while statistical, of the sound of the ocean (the variation of which is inscribed within a limited field of possibilities) makes it a sound both archetypal and exceptional. But sounds that are simultaneously continuous and stable with regard to their characteristics—like the rumble of a torrent—are rarer still, although we have long since been able to produce them at will by electronic means.

While the visible universe is by and large made of lasting elements (at least for the human time scale), the sonic universe only includes a tiny minority

of sounds the characteristics of which (mass, intensity) are both enduring and stable, that is to say, that enable us to make them objects of observation drawn from life. This is the paradox that Schaeffer labeled the "closed groove": those few short seconds of sound that vinyl records have for long allowed to loop back on themselves and which he used as the basis for his first *Études de bruits* in 1948. There is doubtless a captured object here, but like a bird that ceaselessly flutters about in its cage and that we cannot stop for a moment in order to observe. Even when recorded—or, as I prefer to say, when "fixed"—sound still moves, because otherwise there is sound no longer.

6. *Because sound is hard to isolate in time and in space—in the perceptual continuum*. With sounds, the identification of cohesive units is difficult. Many sonic events link up, mask each other, or overlap in time and space in such a way that carving them out perceptually in order to study them separately, collectively, or in combinations of elements is difficult. In *Audio-Vision* and *Film, a Sound Art*, I showed how, in the case of cinema—but also with musique concrète and all those arts that make use of sound editing—there is no equivalent for the notion of the shot, that is, the principle of a cohesive unit that is easy to spot in "all-or-nothing" terms (and which is identified, in the case of animated films, as what is perceived between two breaks in visual continuity) and, moreover, separate from the levels of description. For sound, we have no such unit of the sort, and this in spite of Schaeffer's valiant but utopian effort to find a universally applicable rule for dividing sound objects (the rule of stress-articulation, an extrapolation of the notion of vowel-consonant).[18] In other words, the units for dividing up the sonic flux are relative to each listening system (musical, linguistic, and so on) and to its levels of articulation. These units cannot be transposed from one to the others.

To this difficulty of temporal segmentation is added the difficulty of isolating in space a sound that one would like to study in relation to others that exist at the same time. It is impossible for us to "zoom in" on a sound when others resonate simultaneously with a similar force. Moreover, this is probably one of the reasons that music often uses forms that are distinct from "natural sounds" and why it relies on the fact that so-called tonic sounds stand out. Visual forms can be inscribed in frames or onto media that by themselves isolate these forms from the ambient visual jumble, and thus they do not need to be robust. Yet for sound, the robust form, that is, a form that

stands out (e.g., by virtue of having a pitch, of being tonic) is one of the only ways to distinguish one sound among others, since there is no sonic frame for sounds.

7. *Because it seems difficult to take up a disinterested attitude when faced with sounds*. To maintain in sonic life—or to suggest that others do so—a purely descriptive and disinterested attitude, like a curious onlooker, is not so easy, since sound triggers enormous effects. It is the prerogative of the auditory, without equivalent in the visual domain, that the purest of sonic delights is ready at any moment to tip over to torture and that musical paradise is ever two steps from hell. All that is required is a small maladjustment or tiny slipup. The lovers of bel canto, for whom the pure note—the object of supreme pleasure—is right next to a clinker, know something about this. And this all the more so since technology (amplification, the possibility of resculpting recorded and broadcast sound) has multiplied the opportunities both for such incidents to take place and for our pleasure: jammed cassette decks, damaged portable devices, worn-out speakers, excessive loudness, the startling squeal of audio feedback. . . .

8. *Because sound stubbornly refers us to something other than itself*. To all appearances—and there is something of a curse at work here—sound is always that which refers us to something else. Listening to sound for itself is diabolically difficult. This is, moreover, the very reason that Schaeffer had to invent a concept to deal with this issue—the concept of reduced listening—which at first he could only define *by negation*.

9. *Because sound is perhaps the most easily influenced of all perceptual objects*. Some aspects of sound sensation are more easily influenced by visual information than the other way around:

- As far as space is concerned, sound takes up perceptual residence there where we see or even where we mentally locate its cause.
- As far as the identification of causes is concerned, the "figurative vagueness" of sound paradoxically conduces to making a given sound open to a great variety of causal attributions. The result is that every sound, even the most abstract, is potentially figurative and that its "objective" audition is from then on influenced and parasitized by all manner of extrasonic associations and representations.

10. *Because maybe sound is not an object*. In his seminal essay "Le perçu et le nommé [The perceived and the named]," Christian Metz very nicely

described the usual attitude to sounds, which treats them as characteristics and not as objects:

> If I refer to the "hum of a mechanism," my interlocutor will think that he does not really know what I am talking about ("Which mechanism?"). I have been, however, very specific in classifying the sound [*bruit*], while remaining vague as to the source. All I have to do is invert my axes of specification and say, "It's the sound [*bruit*] of a jet airplane," in order for everyone to judge that I have expressed myself clearly and to feel satisfied. From the moment that the sound source is recognized ("jet airplane"), the taxonomies of sound itself (humming, whistling, etc.) can only furnish—at least in our day and age and in our neck of the woods—supplementary specifications that are sensed as not indispensable, at bottom adjectival in nature, even when they are linguistically expressed by substantives. [. . .] Ideologically, the sound source is an *object* and the sound itself a *characteristic*.[19]

At the same time, Metz admirably captured the complexity of the problem by starting with the words themselves:

> From a logical point of view, "humming" is an object—an acoustic object in the same way that a tulip is an optical object. Moreover, language takes account of this—or at least, it does so lexically, if not discursively—since a great number of recognizable sounds [*bruits*], which are notwithstanding relegated to the rank of characteristics, correspond nonetheless to substantives. What we have here is a sort of compromise, albeit one that does not prevent auditory traits from participating in a weaker manner than other traits in the hegemonic principle of object recognition.[20]

The author then points out correctly concerning Schaeffer's notion of the sound object—or at least concerning the structure of his formulation:

> Furthermore, when someone wishes to denominate the very concept of "sound object," it is necessary [. . .] to add to the word "object" the epithet "sound," whereas no specification of the sort is needed for what would logically be called a "sight object." We consider it obvious that a banner is an object (unqualified), but as for a hoot, we waver: it's a sub-object; an object that's merely sonic.[21]

Traversing all that I have recalled, sound takes on the appearance of a non-object blanketed in qualities and properties because, one might say, endless

description never manages to constitute it. One asks, "What do I hear?" A semblance of phenomenological common sense would have us answer: "In any case, I hear a sound." And yet, there are many other possible responses to the question:

- I listen to indices that refer to a cause.
- I listen to the registers and the mass of a sound, in short, variations in pitch, when the sounds are tonic. I thus hear the variations of a particular value, pitch, and within pitch, I hear rising and falling, trajectories, intervals, shapes that are transposable into spatial perception. . . .
- I listen to timbres, colors, textures, thus global characteristics that do not make up "values," in the sense that they cannot be abstracted from sound objects that mediate them.
- I listen to the law of progression governing a sound: it gets louder, softer, faster, gets closer. Here, we no longer have to do with an object that would be called the sound, but with an unfolding.
- I listen to time and rhythms; I am then partially in a transsensorial zone (see below).
- I listen to all the indices that relate a sound to space, and these indices are cross-checked with other spatial indices via the channel of other senses.

Each of these ways of listening has its criteria and its own time scale. One of them takes up the "sonic units" one by one; another detects long-term variations or middle-term patterns of repetition or development. There is not a single reason that a selfsame reifiable object called "sound" should be the meeting point of all these modes of listening, which bear upon different aspects, different scales, different references, and can involve other senses. . . .

Sound Partitioned Anew

Ought we not then call into question the idea that—even while sticking to the perceptual level alone—the word "sound" could in the least bit correspond to a homogeneous and material domain capable of complete reification? I mean by this that sound, with the exception of rare instances where it is a stable and constant phenomenon, appears as an element entirely linked to time and changing constantly in intensity, frequencies, spatial aspects,

and so forth, such that speaking of sound as matter endowed with stable properties such as a certain pitch or a certain intensity is unsatisfactory. Modes of sonic variation are as important and sometimes more important than the fact that a given sound is low or high. As I wrote back in 1990:

> Substantializing sound, making it into matter endued with diverse properties depending on its different frequency zones—bass frequencies would have this effect and high frequencies another—as doctors, music therapists, or reputed psychologists are wont to claim, is an overly simple stance. It would appear, rather, that it is not so much the substance of a sound that counts, actually, as its modulations, its palpitation, its kinetic curve, its information, etc. These are all things that, defined by temporal and spatial variations, can be considered partially transposable to other sensorial frameworks.[22]

Sound is only comparable to a substance in certain precise instances. These may be natural. For example, an enduring sound, such as a torrent, heard under likewise enduring circumstances, that is, by someone who does not move. They may be cultural. Certain types of music create a statistically continuous "sonic matter." But these instances remain in the minority in our auditory experience taken as a whole.

I have spoken of the "window of listening" or "auditory window" as that frame in which a verberation is capable of producing an acoustic sensation located in the ear. This reifiable sensation distinguishes itself by the peculiar acoustic properties, either constant or variable, of pitch, mass, materiality, intensity, and can be—although not necessarily—accompanied by bodily covibrations. Certain sounds located in the middle-high frequency range and of middling intensity, such as those used in music, in essence only address themselves to the auditory window and do not awaken any covibrations. These are sounds that deaf people cannot feel. The deaf actress Emmanuelle Laborit speaks of violin sounds as impossible for her to perceive, and these are thus sounds that specifically and solely affect the auditory window. To complement the term *auditory window*, I have suggested the term *covibration* to designate the phenomenon by virtue of which a part of our body vibrates sympathetically, so to speak, along with a sound. This takes place in particular with bass frequencies and for certain vocal frequencies (at the level of the larynx). Covibration regards everything in sound that affects the body beyond the "auditory window" properly speaking. Certain bass frequencies at certain intensities make the body of the listener resonate

by covibration while drawing an acoustic image via the auditory window of the ear, whereas other sounds, because of a more middling intensity and higher pitch, are content to inscribe themselves at the window alone. We are thus led to infer that simultaneous sensations of acoustic figuration (in the window of listening) and of bodily covibration are only identified with one another and called by the same word "sound"—notwithstanding their profound difference—because they are felt as the effect of the same causes and because they are produced at the same time.

In the same manner, a specific light-related sensation systematically and synchronously associated with a particular sound sensation—the one not capable of being separated and consciously isolated from the other—would be perceived as "the same." What we call *the* sound—a singular form that asks to be called into question—could thus in certain precise instances be *bisensory* (that is to say, affecting two senses at the same time), which could help explain why a perceiver's physical involvement is more immediate and more uncontrollable with sound rather than with the image, which is *monosensory* (there are other reasons for this difference in physical involvement: the impossibility of "averting listening" as we avert our gaze, as well as the frequently *nondirectional* aspect of sound, such that it surrounds us).

Certain ambiguities, certain obscurities and impasses in the theoretical research on sound are removed or unblocked if we abandon the falsely obvious notion that the term "sound"—in the sense of object of listening—designates a homogeneous category of perception. In reality, in sound there is both what is reifiable (that which inscribes itself via the auditory window) and what is nonreifiable (sensation qua vibration), and it is not always easy to draw a neat border between them. Take the experience of a vibrating tuning fork applied to the body. As Henri Piéron explains, "A tuning fork at 100 Hz pressed against the wrist, elbow, knee, or shin arouses a vibratory sensation that can stretch the length of the arm or leg."[23] This example is quite telling, because covibration felt in this way does not have a precise tonal aspect—this aspect is reserved for what passes through the auditory window. It is no less a sensation for this, and subject to subtle and sophisticated rhythmic modulations. The tuning fork is a fascinating sound source, because its vibration can yield no distinctly audible sound unless applied to a rigid surface (e.g., a table . . . or cranial bone).

In fact, we are continually subjected to covibratory sensations, which are the constant accompaniment of many sounds that we perceive. Thus, one of the main sounds that we hear, which is that of our own voice, is accompanied by

internal vibrations of the body, such that the sound is perpetually coupled to covibrations. These covibrations are purely rhythmic, but with modulations in intensity, while the portion that enters through the auditory window has perceptual properties of mass and of materiality. All this forms a natural association because of the identity of the word "sound," but also by the conditioned reflexes of habit. Furthermore, if a piece of music that we have initially heard at high volume is played or played back at a lower volume (so that there are no longer covibratory bass frequencies felt in the body), recognition of that piece of music can awaken via memory, a conditioned reflex, corporeal vibrations. Sound is in such an instance bisensorial from bodily memory. This is the reason why we tolerate listening to certain pieces of music in circumstances where the sound is but a pale reflection of what it ought to be.

In sum, sound should be considered as bisensorial—and thus with added impact—because of this effect of sensory doubling whenever it addresses itself to the auditory window at the same time it affects the body through covibration, which is the case for many audible phenomena: vocal sounds, which elicit nervous microreactions at the level of the auditor's larynx; powerful sounds with heavy bass components; and so forth. It seems to me that this formulation of the bisensory nature of sound—or at least of certain sounds—allows us to get out of fruitless debates of the following sort: Do we hear with "the entire body" or not?[24]

I have evoked with the term *transsensorial* perceptions that are those not of a particular sense but that can borrow the channel of one sense or another without having their content and their impact enclosed within the limits of that sense. For example: everything that has to do with rhythm, but also a certain number of spatial perceptions, as well as the dimension of language. A word that is read or one that is spoken pertains to the linguistic sphere, even the modalities of their transmission (writing by hand, the timbre of the voice, etc.) at the same time touch on dimensions peculiar to each sense. In other words, speaking in the terms of the transsensory serves as a reminder that our senses are not closed in on themselves.

Rhythm is the fundamental transsensorial dimension, since it is a prenatal form of perception, notably felt through pressure variations of the surrounding bodily walls, in rhythm, as we have seen, with the doubled pulsation of the heart of the fetus and that of the mother. Rhythm is everywhere. In the past, for example, at night before electric illumination, it was found in the palpitating light of candles, which furnished a sensorial variation that

we have lost and that we are forced to replace with others (in particular the flicker of the television screen). Human beings require a sensory diet that consists of rhythmic variations, and music is one of these. The absence of sensory variations quickly becomes hard to bear. *Texture* and *grain* make up another category of transsensorial perception. As for *space*, it puts forward a particular question: today it is often conceptually classed with the visual. Yet space is not something visual. The experience of moving about in space by touch also forms it. Someone born blind and capable of motion has a much more concrete representation of space than a sighted person with a congenital disability that prevents motions allowing one to touch objects. Moreover, sight works in part haptically, like a sense of touch at a distance.

The Metaphor of Continuous Perception

Here there is a possibility for misunderstanding that I have noticed when I have explained this hypothesis. This misunderstanding consists in flattening the concept of the transsensorial to one that is much more generally accepted yet less well-founded: that of synesthesia. Indeed, on this topic someone will often launch into the immense and slippery theme of correspondences between sounds and colors or of other colored forms of listening. And at this point, the research of Father Castel and his "color harpsichord," where each note struck corresponded to a different ribbon of color, never fails to get a mention.[25] One might also cite explorations by composers such as Alexander Scriabin (his *clavier à lumières* or "Chromola" in *Prometheus* [1910], an audiovisual symphonic poem), Olivier Messiaen, or Karlheinz Stockhausen. The "color organ" that the humans employ in Steven Spielberg's film *Close Encounters of the Third Kind* (1977) to welcome the visitors from outer space and where each degree of the universal pentatonic scale is linked to a color that lights up simultaneously when the note is played is a simplified version of this lovely myth.

For my part, I am skeptical—not about the undeniable phenomenon of "colored forms of listening" and other types of synesthesia—but about the utilizable and generalizable nature of a theory on the subject. Messiaen said he heard chords in color and not notes. And why should we doubt his word? For others—myself included, for example, but other musicians and music buffs that I have met as well—color is in an instrument's timbre. For Scriabin, it was a sound's degree in the scale. In short, to each his own correspondences. And this leads me to think that the latter are subject to the powerful

cultural, individual, and historical influences, and that we must take each of these factors into consideration.

In many respects, Jean-Jacques Rousseau's refutation of certain false synesthetic analogies remains valid: "Sounding bodies submitted to the action of the air constantly vary in size and sound. Colors endure, sounds vanish, and we are never sure that those that next arise are the same as those that have disappeared. Further, each color is absolute, independent, whereas every sound is for us only relative and stands apart only by comparison."[26] It is just that, once again, everything depends on what one is calling "sound": is it the value that the sound makes stand out, such as the value of pitch (which is what Castel based his correspondence keyboard on), or rather the note as vital sonic matter, a being with a temporal existence, which is what Rousseau first refers to ("sounds vanish")? But in the following sentence, we find him using the word in another sense, that of the "differential value of pitch," when he says, "every sound is for us only relative." The problem in thus not quite so simple, and the word "sound" is always the hub—that word that links everything to everything else.

In the French literary tradition there are two familiar and famous sonnets on sensorial synesthesia: one by Baudelaire and the other by Rimbaud. I would point out, however, that sound as such only plays a limited role in them. The celebrated poem "Correspondances [Correspondences]" in *Les fleurs du mal* [*The Flowers of Evil*], while it postulates a "dark and deep unity" of sensations where "scents, colors, and sounds respond to one another," refers to the sonic only in order to evoke the "sweetness" of the oboe (strange choice, given the instrument's bright, nasal, rustic timbre is seldom associated with sweetness), is interested above all in odors, that is to say, in the mode of perception at once the most archaic—directly linked to our reptile brain—and the most enveloping. And yet the poem does end without a comparison of trees to "living pillars," the rustling and groaning of which are "confused speech"—the same speech that Cage wished to no longer hear . . . speaking.[27] For his part, when Rimbaud writes his "Vowels" sonnet ("A black, E white, I red, U green, O blue"), he associates as much with the writing of the letter as with sound—if not more. "O" is round like an eye—in French, moreover, it is also the first letter of the word "eye" [*œil*]—and evokes blueness. "I" is straight like the line of a mouth, and evokes the color red with the "laughter of beautiful lips."[28] In this respect, the letter is a springboard for the imagination, as much because of its visual aspect as for its sound aspect, and it links the two.

Here, Rimbaud places himself in a long theoretical line of writers who have "dreamed about" and forged associations with the letters of the alphabet. This line includes Paul Claudel, but also Antoine-Pierre-Augustin de Piis (1755–1832), whose poem *L'harmonie imitative de la langue française* [The imitative harmony of the French language] with inexhaustible eloquence personifies the letters of the alphabet at once as sounds, as phonemes, and as written characters. Rimbaud's exploration is doubtless more ambitious, and it aims at a sort of totalizing alchemy where the sonic gradation of vowels (the possibility of gradually shifting from one to another) echoes the gradation of the color "spectrum"—even if in his poem the colors do not follow the canonical and circular order of red, orange, yellow, green, blue, indigo, and violet.

We know how important the myth of synesthesia has been in experimental cinema, and I have written a bit about some such films in this regard in my study *La musique au cinéma* [Music in film] (in particular about the fine films of Len Lye, Norman McLaren, and others).[29] Let me limit myself to saying here that often, when one speaks of synesthesia, we must see the transsensorial: a common term, a movement or gesture that creates a pivot between that which is seen and that which is heard, with "synchresis" taking on the task of uniting into an ephemeral and contingent whole whatever sound and whatever visible motion.

In reality, the concept of synesthesia (as "correspondence" between precise perceptions peculiar to different domains) cannot hold in many instances, as soon as we become aware that each sense does not represent a homogeneous and closed perceptual domain. Likewise, when it is said that light is a sound too high-pitched for the human ear to hear but that one day it will become accessible to another ear awakened in another life and that, indeed, we will be able to hear the music of the spheres, like the movement of love that, in Dante's words, "moves the sun and the other stars," we must fully comprehend that sound has become a metaphor.[30] On the physical and sensory planes, such an assertion is, in effect, sophistry. Granted, this makes it no less a spiritual truth. Roland de Candé has already done justice to certain speculations when he writes that "some works of scientific vulgarization reproduce seductive tables of the range of frequencies of phenomena essentially or apparently vibratory, from the lowest sound on an organ (around 16 cycles per second) up to the wavelength associated with the proton (around 2.3×10^{25} cycles per second), passing via bat calls (15,000–16,000), high radio-electrical frequencies, the light spectrum, X-rays,

and cosmic rays! Such a table is an absurdity, because the phenomena represented on it are in essence completely different."[31] The important thing is that sound serves as the metaphor for a type of perception that is continuous and without edges, which passes into a field of reifiable objects—those that bring something to the auditory window—but that overflows this window. Sound is the symbol of a type of perception that cuts across our senses while exceeding their frames and that makes us feel that it continues somewhere beyond. . . .

Enlarging the Territory of Acoulogy

Object or non-object? The two parts that make up this chapter do not at all aim to negate one another but rather to add together their points of view. That the question of sound as an object should remain problematic, contradictory even, means that sound *is* this contradiction. All the components of an acoulogy will be found herein. With Schaeffer, acoulogy—a term that he invented—designates the study of the mechanisms of listening and of the properties of sound objects with respect to their potential for music within the perceptual field of the ear. In this sense, it voluntarily puts to the side anything that concerns modes of listening other than reduced. I have chosen to take up this word "acoulogy," which had been left unused and, in my *Guide des objets sonores* [*Guide to Sound Objects*], I had revived Schaeffer's meaning with the aim of extending its semantic domain. Acoulogy, which aims at becoming a science, would then be the science of what one hears considered from every angle (whereas for Schaeffer it concerns sound exclusively from the perspective of reduced listening for the purposes of conceiving an overarching music). There is no reason not to be interested in causal and figurative listening, in the identification of causal schemata, and so forth.

Contrary to Schaeffer's acoulogy, mine does not immediately target a musical, cinematic, or more generally artistic outlet. Its goal is knowledge. It is even more interesting for music that it not be directly targeted by acoulogy. Likewise, if geometry has been able to enrich expression in the plastic arts, this has been to the extent that it was constituted as a science—without direct artistic aims—of geometrical forms. Nothing is stopping the same individuals from carrying out acoulogical experiments and research and in tandem creating artworks. Claiming to combine the two activities into a single one, as some have claimed to do, has often led, because of the difficulties

involved in reconciling the respective demands of the two approaches, to cheat on one or the other of these spheres. What good is an art-cum-science that succeeds neither at being an art nor a science? With Schaeffer, the acoulogical project (in the sense that he gave the word) had a horizon and an ideal: reunion with music—with the "most overarching" music possible. In my case, I do not believe it possible to deduce forms of music directly from acoulogical observation. Yet indirectly, that music can draw nourishment from acoulogical research, as can other aspects of art of understanding; of this I have no doubt. It is an undertaking that enriches, sheds light on, and feeds all of listening and thus, gradually, all of existence. And this without taking into consideration the possibility that this disinterested research, based upon language, upon naming and formulating, will one day discover unforeseen opportunities, applications, and consequences.

12))) Between Doing and Listening

NAMING

The Conditions of Listening

From the outset, we have seen that my approach aims to pose anew the question of sound in different, nonnaturalizing terms. This is why we should not hesitate to ask about the conditions of sound observation in their most material guise.

Contrary to what has often been put forward, listening and sound are not bound to being natural. Even the nonmusical noise that calls out to us from every side is capable of being isolated, set down, and artificially created as a *sound thing* [*objet-son*], thanks to media of fixation, which enable us, human beings, to reappropriate our own audition. The latter can become a nonspontaneous process, practiced in refined manners within frameworks conceived just for it. This attitude is sometimes put into play for music, but not for all sounds in general. My concern here also comes from the experience that I have often had as a composer of musique concrète, during concert rehearsals where my works for recorded media have rubbed shoulders with instrumental pieces. When instrumentalists rehearse, all those present in the room—technical personnel, friends of the musicians or of the composer, organizers—keep quiet, but when sound comes out of a loudspeaker, they feel free to make noise—that is, not only not to pay attention to what is happening but also to muddle and smother it. So I began to wonder what would be the necessary conditions for a sound coming from a speaker to obtain the listening respect that it is owed without imposing itself by a deluge of decibels, and thus under what conditions it becomes identified as a sonic being with which the auditor comes face-to-face. Of course, as soon as that

auditor heads out into the street and rejoins the day-to-day, the same conditions will no longer attain.

The way in which we listen or have others listen to sounds from loudspeakers is actually, without us realizing it, an ongoing aggression, with the auditor subject to abrupt sonic comings and goings and contrasts between total silence and acoustic surges. The conditions of observation are brutal, and disturbed by a tension linked to the fear that a violent squeal—a parasite—might suddenly leap from the speakers. Imagine that during the showing of a film, the room suddenly becomes completely dark. Suddenly an exceedingly bright image assaults the entirety of your visual field, and then goes out before the room lights up once more. This is what happens to our ears when we are carelessly subjected to listening at high volume to sounds via loudspeakers. In a piece of music or a film, violence of the sort can have a dramatic or aesthetic meaning—provided the artist takes responsibility for it as such and has something to say with it—but for sonic observation it is rather a drawback.

The conditions of audition are thus extremely important and largely explain the difficulties we have in listening to sounds. These difficulties are not, in fact, inherently cultural—a lack of habit of a certain civilization, namely, ours—or solely a matter of laziness versus willpower, as if we had become incapable of concentrating. These are typical problems created by machines that allow us to instantaneously transmit a sound and to stop it just as abruptly. In particular, we do not know how long sounds to which we are subjected will last or at what strength they will be administered. How can we focus our attention when we are preoccupied with possibly having to cover our ears?

I am convinced that some small, completely doable changes in the way that we go about the matter could enormously facilitate the study of sounds. Sometimes it would be enough simply to enlighten the auditors about the conditions in which they will listen. They might perhaps be permitted to prepare themselves by employing systems analogous to the lights in recording studios that signal the onset of sounds. Care might be taken to considerately handle pauses. In short, an entire sonic, visual, and verbal framework to prevent auditors from being needlessly taken by surprise and disturbed by the sound to which they are listening might be provided. (Again, I am only talking about listening conditions for observation, not about artworks that use sound and do so by design.)

We listen better in low or filtered than in glaring lighting. Human beings have a certain amount of attention to dedicate to whatever makes demands

on our senses. If the eyes are occupied with seeing a certain number of things, the quantity of attention that can be given to hearing is diminished. On the other hand, if light produces a sort of scattering of attention, absolute darkness, which is what some recommend for proper listening, is another source of distraction. With humans, pitch blackness creates the feeling of needing to protect oneself because it puts us in an unknown and potentially hostile environment. Plunged into total darkness, we need to be really familiar with a place. What if we had to stand up? We would be in danger of breaking our necks, and the like. Moreover, the speakers should be placed in front of the audience, the latter arranged along the same axes as if they had something to view. It is worth placing something before the eyes, even in semidarkness, which can be viewed or at least made out. Because our cone of attention is situated in front of us, a visual crutch such as an illuminated speaker or patch of light paradoxically works as a hearing aid.

Constitution of the Sound Object through Repeated "Listening Layers"

It therefore does not suffice to say that a sound has been "fixed"; we must ask ourselves how this changes the way we hear and how the multi-audition that fixed sound enables functions. Already, starting from the moment that via fixation we can hear something more than a single time, sound is no longer the result of listening. (Which act of listening would this be? The first one? The subsequent ones?) Or, in any case, it is not so in the mythologizing sense of ineffable and onetime communication with which this word is endowed. Records replayed often thus construct an object that goes beyond the psychological and material vagaries of each successive listening. There is as yet no word to denote this gradual hollowing out of an imprint, this listening-by-listening constitution of an object that from then on preexists the new act of listening or rather the new audition that will be made from it.

Listening upon listening, or audition upon audition? It is actually improper that we often speak of listening as a conscious and attentive activity, or rather as an attitude of availability entirely geared to its object. A fixed sound heard several times is not necessarily listened to—isolated by listening—but it nonetheless impresses a form, an ensemble of features; multi-audition, even when it is not a conscious activity, is nonetheless constitutive of such activity. This is why I speak of the multi-audition of fixed sounds. "Re-audition" is indeed an inappropriate choice of words. What is

at stake is not in the least the repetition of a previous act of listening, since memory tracks are retraced: the second returns to the tracks of the first act of listening, the third to the two prior, and so forth, as when printing an image in several colors. The "listening moment" in this case no longer has the same importance. That which is deposited in memory not as event but as object is no longer tied to a particular moment. Over the course of multiple new auditions of the same recording, one might even be tempted—if these are not accompanied by a specific intention—to listen less and less.

To the extent that, within the act of listening, it increases the role of pre-perception, that is, opening sonic matter in general to what before 1877 principally held for its musical facet, the relistenability of fixed sound is therefore not in itself enough to vouchsafe better attention: one prehears what is going to take place, and thus no longer listens. A traveler who every day takes the same route is not necessarily the one who will best memorize the variety of the countryside. Another traveler who takes the same route three times but has mustered her conscious attention and named what she has observed will be more familiar with it. Refreshing and restarting the act of listening to fixed sound requires an entire procedure or in any case certain precautions, just as with film refreshing one's vision for a shot watched too many times in the editing room.

Laying Hold of Sound through Notation?

The issue of traditional notation—for the purposes of study, archiving, access, and, of course, composition—comes up whenever constructing a sound is at stake, and this whether we are considering the use of existing forms of notation or imagining new ones. Among other things, notation aims to solve via spatial symbolization the vexing problem of studying an object that is tied to time. Up until the beginning of the twentieth century, in traditional Western music, sounds were spoken of by simultaneous reference to three levels, and these in harmonious agreement:

- A musical writing system (learned in conservatories).
- Notational symbols and conventions, which were used for writing and reading music (via inner audition) and for reconstituting it (via execution).
- The auditory experience of timbres and combinations of timbres issuing from a restricted corpus of musical instruments—even if over

> the course of centuries this corpus was enriched with new species. These instruments were the almost exclusive means employed for playing music.

To an extent, notating sounds, in the framework of this system that still holds for a large share of contemporary music, is already at best a partial description, but this description is more or less precise depending on the value in question. Everything in the traditional Western musical system reveals the preeminence of the value of pitch over other aspects of sounds. The entire system rests above all on the manipulation of this value, and the musical notation of pitch is of an almost absolute precision if we compare it to the notation of other values. Ultimately, instruments are built and calibrated to well-defined and exactly positioned gradations of pitch, as well as arranged according to different registers (bass, tenor, alto, etc.).

Pitch: The qualitative perception of the quantitative physical phenomenon of frequency, pitch is designated in the notes of the traditional Western tempered scale (letters of the alphabet in the case of English and German, with minor variants; the "do-re-mi-fa-sol-la-si" naming convention in French and other languages). This leaves to the side those sounds that Schaeffer calls complex. The pitch of tonic sounds is the only value capable of being notated—and thus described—and reproduced in *absolute* terms. Notwithstanding, it must be said that what scores notate above all are the horizontal structures (i.e., melodic ones) and vertical structures (i.e., harmonic ones) of *intervals* and *variations* of pitch. Within certain limits, the system in effect allows for the principle of transposition, particularly with vocal chamber music: a lied by Schubert or a melody by Fauré will often exist in two versions in different keys, one for "high voice" and another for "low voice." On the other hand, it is not usual to transpose instrumental music, excepting arrangements for beginners of famous piano pieces.

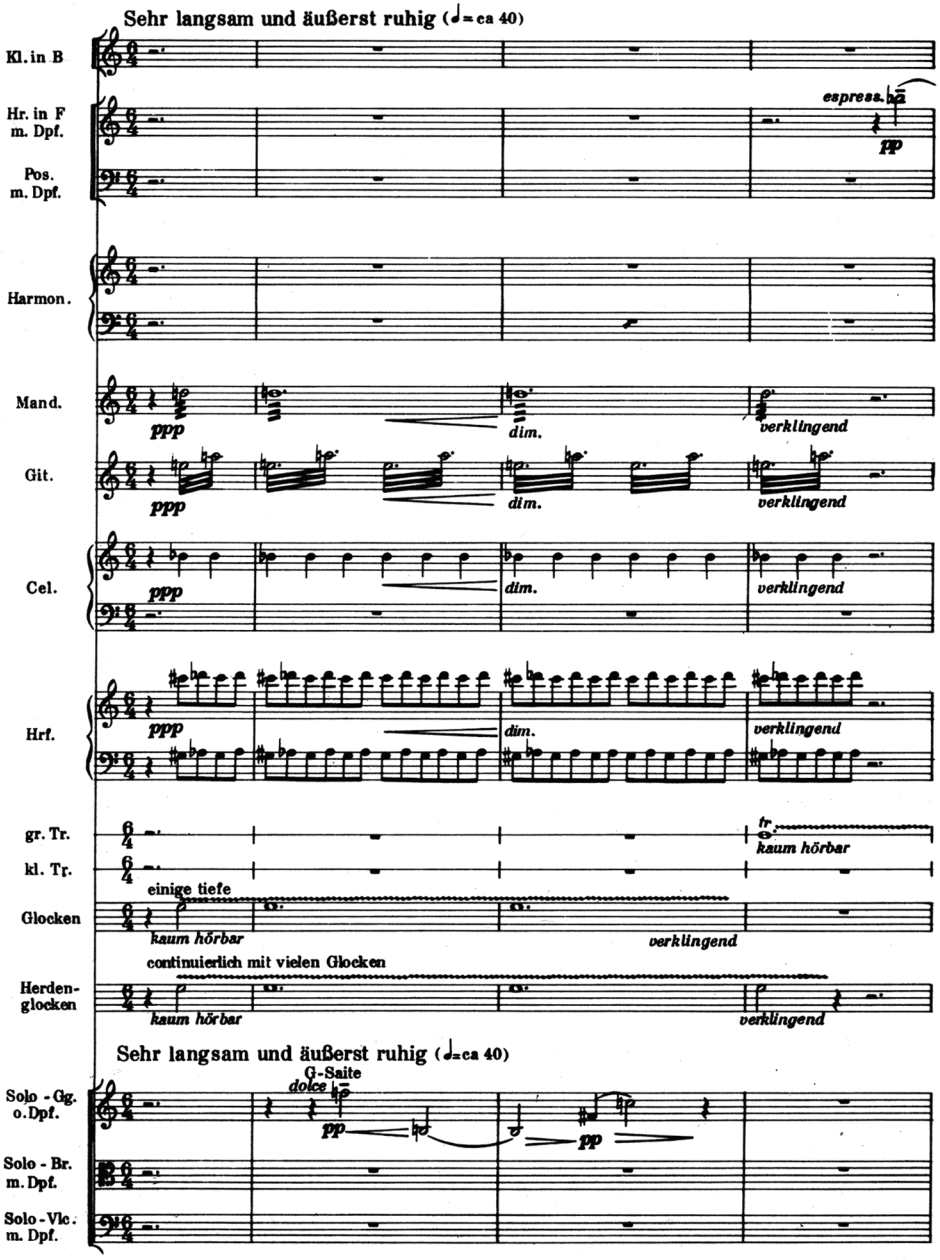
In other musical systems, a note's name will not designate an absolute pitch. For example, in traditional Indian music, the syllables "Sa, Ri, Ga, Ma, Pa, Dha, Ni" do not designate precise pitches but positions within the scale or mode (like the terms "tonic," "third," "dominant," etc., in the Western system). This enables the transposition of musical pieces according to the register of the voice or of the instrument. For all that, these systems are familiar with the principle of standard pitch as a reference; it is just that they do not make as systematic use of it as in Western music.

Duration: This is qualitative perception of chronometric time. Duration began to be possible to notate as an absolute value, in traditional music, after the invention of the metronome at the beginning of the nineteenth century. What is notated, in fact, are not durations but the structures of duration or rather temporal spacing between sounds. A quarter note or eighth note in itself represents nothing at all. And even after Maelzel's invention and metronome indications marked down since Beethoven by musicians on their compositions, the greatest freedom remains the rule for interpreters insofar as defining tempo is concerned, that is to say, in the choice of absolute durations, whereas for the execution of rhythms, that is, the spacing structures, a (relative) rigor is observed. This, of course, because no one perceives absolute durations and cannot say of sound by mere listening whether it lasts five seconds and six-tenths, whereas we are able to perceive with subtlety the structures of duration.

Intensity: The qualitative perception of either constant or variable amplitude of the physical signal, intensity is a sound datum the notation of which in traditional music, that is to say, the way in which it is described, "read," and reproduced, is by contrast more vague and relative. What counts are above all *contrast* and *context*. Basic notations—a range of indications from triple piano, abbreviated to *ppp*, to triple forte, abbreviated to *fff*—suffice to provide vague but acceptable markers for the composer in the framework of the traditional system concerning intensity levels, contrasts, and profiles. On the other hand, structures of intensity—oppositions, increases, and decreases—are more or less preserved across various listening ranges, and they work, as was noted in the nineteenth century, to "great effect" when it comes to music. Traditional Western music, like many others types, even treats them as of great importance, either at the level of execution (to learn how to play the violin means, among other things, learning an entire series of techniques to make sound "carry" and to constantly modulate its intensity) or, as we get closer to our own period, starting with the score itself, where dynamic indications are often numerous and obsessive.

Timbre: The "unnotable" value par excellence, timbre is indescribable in traditional music. What's the use of seeking to describe it anyway, since it is enough to name an instrument to evoke in the musician's faculty of inner audition the sound image of its specific timbre? This is why defining timbre can only be tautological: it is that "characteristic physiognomy" of a musical

III.


Sehr langsam und äußerst ruhig (♩= ca 40)
Kl. in B
Hr. in F m. Dpf.
espress.
pp
Pos. m. Dpf.
Harmon.
Mand.
ppp
dim.
verklingend
Git.
ppp
dim.
verklingend
Cel.
ppp
dim.
verklingend
Hrf.
ppp
dim.
verklingend
gr. Tr.
tr
kaum hörbar
kl. Tr.
einige tiefe
Glocken
kaum hörbar
verklingend
continuierlich mit vielen Glocken
Herden-glocken
kaum hörbar
verklingend
Sehr langsam und äußerst ruhig (♩= ca 40)
G-Saite
dolce
Solo - Gg. o. Dpf.
pp
pp
Solo - Br. m. Dpf.
Solo - Vlc. m. Dpf.

sound that makes the instrumental source recognizable. It is no more necessary for the composer to specify the components of that physiognomy when writing music than for a director to describe in detail in a script the features—nose, mouth, eyes—of someone cast to act in the film. All a composer has to do is name the instrument.

It is important, however, not to expect more from notation than what it can give and to challenge its myth of the mastery of sound through spatialization. If anyone were to claim that it is impossible to study images without notating them in sonic form or that it is possible to provide for a visual object an auditory representation that preserves all its visual features, we would burst out laughing or find the claim absurd. Whereas the inverse—that it is possible to study sound via written visual representations and even that "sonography" allows us to visualize the sound as a whole—is still often claimed today. Even in the exacting field of traditional music, notation has never enjoyed the exhaustiveness and precision that some have lent to it. In this case, what notation transcribes are not the sounds themselves but specific values selected as "musical" ones, which is not the same thing. A classical score for piano does not transcribe piano sounds; it describes neither their characteristic development nor their timbre. Classical Western notation represents the notion of a sort of pointillist breakdown of all the components of sound into encoded signs. It does not proceed in a holistic fashion—where a given symbol would represent and render the entirety of a sound—but by the juxtaposition of markers: the pitch of a sound plus its duration relative to others plus its timbre (by indicating the instrument) plus certain specifics about intensity, attack, manner of playing, and so forth.

Certainly the notation of *pitch* becomes deceptive as soon as it is adapted for indicating glissandi, that is, continuous shifts from one pitch to another

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Orchestral score of the third of *Five Pieces for Orchestra*, op. 10, by Anton Webern. Pitches are noted in absolute values, tempo indicated in intentionally approximate fashion (a quarter note is worth "about"—since "ca." means "circa"—a fortieth of a minute), intensities simultaneously with so-called hairpin symbols, conventional letter indications such as *pp*, and verbal instructions in German and Italian. The same goes for the manner of performance: "Hardly audible" (*kaum hörbar*) explains the composer. The whole imitates the high-altitude murmur of a faraway herd and calls up cowbells (*Herdenglocken*). Credit: Anton Webern, "5 Stücke für Orchester op. 10/11" © Copyright 1923, 1951 by Universal Edition A.G., Wien/ue 5967.

over a large interval. It is easy to notate an unbroken glide that begins, for example, at a low C and moves to the C an octave higher by linking them with a line, optionally accompanied by the abbreviation *gliss.* for glissando. In so doing, only a cause has been depicted and not an effect. The notation, however, in effect induces us to think that the glissando "passes" through the intermediary notes, just like the line that represents it crosses the lines of the staff—whereas for the ear, a perfectly smooth and unbroken glissando between two distant notes absolutely does not sound like a sort of voyage in space that crosses the intervening notes. As Schaeffer emphasized, we find ourselves here in a different mode of listening and in the field of coloration—on a smooth wall without purchases from which to hang pitches in the way that "scalar" perception allows. The coordinates marked by the musical staff become a cheat.

As for *duration*, the symbols for rhythm in traditional Western music, adapted for a type of music with a regular meter, are fairly rigid and cohere via simple arithmetic relationships (from double, triple, and quadruple to half, third, and quarter). When they are employed to "notate" types of music with fluid and complex rhythms—jazz, for instance—various artifices are required or else they must be interpreted flexibly. If someone without auditory experience of classical music were to read a series of repeated sixteenth notes in a score for symphonic orchestra, he or she would imagine that this represents a rhythm. In actuality, in a symphony by Bruckner, for example, repeated sixteenth notes do not produce a rhythm but a rustling. This illustrates the disadvantages of notation if it is taken too literally. That which is not notated as such analysis misjudges or underestimates. Take grain, for instance: the cultural misunderstanding of the criterion of grain by professional classical musicians comes about because they often no longer listen to sounds for what they are but rather as the auditory transcription of a notation. While listening to music, they conjure images of dense rows of sixteenth notes, and they thus believe that they hear what they are visualizing—durations that are close to one another and discontinuous sounds—when they are hearing a continuous, granular sound.

Finally, it is normal to say that instrumental *timbre* in the classical sense is not notated but simply suggested by the indication of instrument or instruments at the start of the staff. But it is more complicated than this because in reality certain markers of duration, intensity, pitch, phrasing, and ornamentation in scores, particularly starting from the beginning of the nineteenth century, have no other purpose except to aim at so-called timbral

effects: the crackling of a trill, the grain of a tremolo, or the shimmering of very high-pitched sounds.

Traditional musical notation not only makes use of notes on the staff or rhythmic symbols but also employs additional complementary symbols that concern either the way in which a sound is produced or indications of movement and expression. These symbols or terms, usually disdained by musicologists and historians of music, interest me because some of them can be applied to all sounds and not only musical notes. There is thus reason to wonder whether they might not be taken up for the description of sounds used in an audiovisual context in particular. For example, in traditional musical notation we find *dynamic symbols*, be they graphic (such as <> for a swell) or linguistic (*crescendo*, *decrescendo*, *diminuendo*, *morendo*, *perdendosi*, *smorzando*, etc.), and that allow for the expression of variations in intensity, of augmentation or diminution of a sound. There are also graphic symbols for "phrasing" that concern the linkage of sounds among themselves and the way in which they are extended or not (slurs, slides, *staccato* and *staccatissimo* marks, dots and ties, stress marks, *sforzando*, and so on). And there are also Italian terms that designate variations of rhythmic pacing [*allure rythmique*] and that are often abbreviated on musical scores (*animato*, *accelerando*, *piu moto*, *piu mosso*, *rallentendo*, *ritardando*, *ritenuto*, *slargando*, *allargando*, *rubato*, etc.).

The opposition linked/detached in particular plays a major role in sonic phrasing. Symbols concerning linkage, which are treated as secondary in classical musical theory handbooks, are thus very important. Those that signify the connection of two sounds as either tied or detached, strengthening of attack, and so forth, are quite valuable and can be generalized beyond the specific instance of "musical" sounds. There are films in which sounds are connected in legato fashion (tied together, flowing) or staccato (unlinked, separate), and likewise, an actor can respond in a very tied or detached manner. The interest of such symbols, whether graphic or linguistic, is that they are simple and internationally understood. There is also room for taking an interest in codes for figuring forth sounds in comic books, both in the case of written onomatopoeias—boom! bang! vroom!—and those shaped by analogy. These codes are, in effect, not completely arbitrary; they are looking to achieve a graphic notation that is sometimes more universal and fundamental than those put forward in contemporary music.

Beyond classical scores, the dream of "visualizing" sound seems as old as sound itself. Our alphabetical writing, based on letters supposed to represent

phonemes (contrary to what is incorrectly called "ideographic" writing, where there would be no precise correlation between writing and pronunciation[1]), would have us believe that such visualization is possible. In addition, at the scale of human vision everyone can see a guitar or piano string vibrate, even if the number of vibrations per second escapes our perceptual range. Finally, each of us will affirm that precise correlations link, for example, the length of a piano string to its pitch. This encourages many to wish for a "visualization" of sounds that would be still more exact and trustworthy—a visualization from which they expect many advantages.

It is interesting to know that experiments in drawing images from sounds did not at all have as their goal to make them available for repeated listening, but to set up a sort of trace or notation—just like the first attempts at recording visual motion, with Muybridge, did not especially aim at the illusionist reconstitution of visual motion (which was even considered a useless curiosity).

In order to address the problems related to concentrating on sound that I have underlined, certain current work methods in audiovisual production, which seek to supplement the absence of a score, have led to the use of—for editing and "processing" sounds recorded onto computer drives—graphic representations in the shape of amplitude and frequency curves. These have their advantages, but also serious drawbacks if we grant them functions that they do not have. If they can in fact provide an access route to processed sounds, if they can serve as a memory aid or visual marker that enables one to locate the sound zone in which one is working—to detect peaks and ruptures in the sonic flux—on the other hand, they can induce a new kind of attention, or rather inattention, to sound, which risks a regression in practice by impoverishing listening. Such emblems can certainly provide helpful signposting for editing (like optical sound did at the time when this format was still used in film editing, enabling synchronization via particular marks, snaps, bangs, percussive consonants in words, isolated noises, types of musical attack, etc.), and they are also a way to study physical structure, but "sonographs" are in no way hearing aids.

Setting Down the Object by Naming It

Notation, if we do not keep these qualifications in mind, is treacherous because it tends to confuse the levels of the material cause of execution and what is heard. An orchestral score is a false friend from the perspective of

listening and if concrete experience does not correct its reading and interpretation. The same "causes" do not produce the same "effects," but notation hides this from us. Its disadvantage, with respect to the description of sound, is not only that it sunders the values that inhere in the object and does not provide an idea of its totality—never accounting for the object as a whole—but also that there is nothing in notation to point out where it is wanting and what it disregards.

Conversely, *words, by their nature, designate incessantly, in their confrontation with the heard, that which they are insufficient to circumscribe*. They imply and never occult their incompleteness. This is why with a writer as meticulous in the verbal accounting of his sensations—particularly sonic sensations—as Marcel Proust, the ever unfinished character of the phrase, which proceeds by added touches and evocation, the open structure—parenthetical openings, notes, a manuscript built of glued and folded sheets of paper—situates the description within its own limits. On the other hand, the most basic and expeditious—the least faithful and most careless—graphic notation closes back on itself and seems to *visually totalize sound*. Notation doubtless has the great virtue of allowing us to grasp "at a glance," synoptically, a sonic unfolding. Its traps are both inciting us to consider sound as a spatial phenomenon and also making us forget that it only concerns values. Finally, it makes us forget what it does not notate. I am not calling for the rejection of all scoring and for depriving ourselves of its advantages. Quite the contrary, I am simply asking that it be balanced by the responsible use of words.

Every act of listening can become a hell because we engage in a sort of bottomless dive where hiding from the beckoning sounds becomes impossible. I am talking, of course, about listening to *all sounds*. Musicians do not have this problem. For sounds that are not musical, they are like ordinary listeners, and if it is true that they are easily disturbed by common noises, they manage to keep these for the most part outside of their field of aesthetic interest. Setting about listening to all sounds is thus to head down a path that makes one wonder if backtracking will be possible. There are even those—like some musique concrète composers and sound-mixing engineers—who go crazy for sounds, like a bear loves his cave, and end up self-centered. In the long run, if you want to make music out of fixed sounds or to enrich the use of sounds in films, you will have to come back to words to structure them. The current tendency with respect to sounds is the opposite. It's not worth the trouble, one supposes, because we have images and graphics. And, after all,

sound is unspeakable, isn't it? To which we might respond that, as long as we have not gone all the way to the end of saying what can be said, the word "unspeakable" is only a dodge.

But there is naming and then there is naming. The act of naming to which Françoise Dolto refers when she remarks how language humanizes the sounds among which the infant lives and that can be a source of anxiety is another problem. It consists not only in identifying and naming a cause (what you are hearing is the vacuum cleaner or the toilet flushing and so on), but also in enabling comprehension and in removing the anxiety that sounds can arouse. Naming sounds in this sense—"mommy-familiarizing [*mamaïser*]" them as Dolto says—is thus doubtless not describing them in themselves. It is to this "humanization" of noises by speech that the poet Rilke alludes when in the third of his *Duino Elegies* he addresses a mother and praises the way in which she has made the world more "friendly" for her infant and the night less worrisome: "The slightest creak [*Knistern*]—and you explained it, smiling, / as though you'd long known just *when* the floor would act up."[2] But we have to move up a level, and here it is not a matter of miming, repeating, or of "recapturing."

Gathering a Vocabulary

Languages, it is said, have few words for describing and designating sounds themselves. At the same time, the myth endures according to which there would exist somewhere beings "close to Nature"—Indians, Inuit—who would have at their disposal many more words to designate acoustic impressions. Some culture or some art would have all the words that we are lacking. It may be that a given civilization or language has more differentiated words to designate a given type of sensory phenomena, including sonic ones, in accordance with its mode of living. A culture or civilization of hunting, like a wine-drinking one, entails a certain vocabulary. Conversely, language usage maintains such cultural differentiation. But we need not rely on other cultures in order to avoid familiarizing ourselves with our own. To designate and qualify sonic impressions, there exist in every language whatsoever more words than its "users"—as those who speak a certain tongue are quite incorrectly styled, as if language were nothing but a utensil!—believe.

A Francophone individual endowed with a solid general culture will be familiar with a certain number of these words and will identify and understand them when they are used by a writer (assuming that our individual

reads), but will never use them in everyday life or work, even if he or she is a musician. Even specialist works constantly say or write "sound" or "noises" when they could specify "shock," "crackling," "crash," "rustle," or "hiss." Such lexicological poverty, when we encounter it in theoretical or scientific works like those I have cited, clearly signifies an a priori stance: the refusal to dignify rustles, crackles, and shocks and to acknowledge them as perceptually specific.

Yet whatever the interpretive parameters of these words might in fact be, they define fairly precise phenomena. We might hesitate at the boundary between crackling and fizzling, but not about what they have in common (an agglomeration of little complex impulses that are high-pitched in terms of site, close together in terms of time but with a nonperiodic, statistically random rhythm, etc.) and about what makes it so we cannot confuse them with a "shock" or a "clink," just like nobody is going to confuse "lapping" with "moaning." Nobody, with the exception of writers, says or dreams of saying—or writes in a study or essay, even one about sound perception—regarding a piece of music by Ravel or about sound in a film that we hear a "clink," whereas this is a relatively precise and specific word. Whether produced by a spoon tapping a cup or a note from a celesta or synthesizer, "clinking" is a sonic phenomenon characterized by tonic mass with a high-pitched or medium-pitched site, that has the qualities of a sound with a minimal weight-image (small scale), a percussion-resonance shape, and a very distinct and clear attack. If you want an onomatopoeia for this, the French expression *ding*—like the English "clink"—pretty well suits. This is a word that is grasped when read in books, but I have never heard, since I began teaching courses on sound, a student or a participant spontaneously come out with "that's a clink." At a pinch, one will say that it's an impact or bell.

My hypothesis is that demanding active verbal precision is an essential means to refine and cultivate perception—to empower listening. It is this that enables us not to be the object but rather the subject of our sensations, when we are able to say something of them and to assume responsibility for what we say. But such verbal precision would make no sense and end up as jargon if it did not draw for the most part from the already existing lexicon—the lexicon asleep in books. It is possible, moreover, that this vocabulary entails traps and is full of the ambiguities and normal uncertainties from a time when sound was not fixed, could not be produced without its "cause," and was not accessible to multi-audition. But we still need first of all to undertake an inventory of it.

I have attacked this matter head-on by analyzing a fair number of scientific and literary texts with the help of dictionaries, and I have seen that there are actually many more words than you might think. The problem is that the words in question make up part of our so-called *passive vocabulary*. I have pursued this labor of listing existing words for sounds in French and in a few other languages across hundreds of texts, works, and sources, and this has allowed me to expose certain complementarities. A language such as French might have more words for a given type of sounds, and another language for another type. Why not then draw up an *international lexicological database*?[3] If an English word is clearer and more precise for designating a given aspect of a sound and does not have an equivalent in French, it is doubtless better to take up this word directly.[4] The discipline that consists in—prior to describing a sound—looking to see if a corresponding word—even an approximately corresponding word—exists and which is the right one, the least ambiguous one, is a discipline that sets perception to work because it forces one to choose. Of course, the requirement that I am putting forward goes against the grain of many tendencies that are seen and even taught in today's society: the employment of words enshrouded in connotations and—under the influence of advertising—seeking out those that convey maximum ambiguity.

There is obviously a permanent dissatisfaction, mingled with the real pleasure of naming, that looking for the adequate word engenders and that is not felt with the most crude and incomplete notation. By this I mean that, having armed ourselves with terms such as "stridulation," "swarming," and "impulse"—which we do use from time to time—we are initially proud and then we realize that they do not enable us to name everything. They irritate us, seeming to us to miss the essential or, on the contrary, to contribute a superfluous precision. Moreover, what is the use of knowing how to designate with the name "impulse" a brief sound and one that we seemed capable of recognizing and isolating as such well before becoming familiar with the word? Aren't we more curious about sounds of long duration, those for which Schaeffer's words do not apply or apply poorly? And aren't we tempted to point a finger at the lacunae and roadblocks of any act of naming? We would be wrong, however, because it is this word "impulse" that enables us to advance gradually into that which it is not. The dissatisfaction that we feel is constructive and constitutes the sign that we are just touching on something. A word such as "grain," which seems to be of limited interest because most sounds are without grain, forces us to hear what grain might be there or not

and to ask ourselves whether absence of grain is perceptually significant or not, and so forth. Each word carries with it its unsaid, that which it does not name, as a structuring axis, and the crisscrossing of verbal lacunae creates a grid for perception, organizing and structuring it little by little.

Take a particular language—French, in this case—and within that language all the substantives constructed with the suffix *-ment* [roughly "-ing" in English (trans.)] that it offers and that can be applied to the perception of sounds. Some, such as *grésillement* [crackling; sizzling], are almost invariably referred to a sonic perception, whereas others, such as *frottement* [rubbing], are as applicable to certain, not necessarily sonic activities or motions as to auditory classification. Consider the word *bourdonnement* [buzzing], which is often used in French literature to evoke insects. When Hugo writes, "A fly enters," this factual notation, which is not even sonic, triggers in us, when we read it, the evocation of a buzzing.[5] Yet in Antoine de Saint-Exupéry, in a scene in which the hero enters a room in summertime, we read, "The flies crackled."[6] Crackled? It is true that a persistent fly on the window of a room that it would fain escape makes a high-pitched sound that is closer to a shrill and precise crackling than to a low and relatively continuous buzzing. . . . Saint-Exupéry, with his writer's precision, has awaked a perception.

Another research method is to go on a bilingual journey.[7] Take the German-French/French-German Larousse dictionary from 1963 and look up "*bourdonnement* [buzzing]." You will find a rich list of translations: "*das Schwirren*," "*das Brummen*," and "*das Dröhnen*." There are also nouns beginning with *Ge-* that suggest a collective activity of the human voice: "*das Gesumme*" and "*das Germurmel*." And consider the nuances marked by the verbal forms: "*brummen*," "*summen*," "*schwirren*," "*schnarren*," "*schnurren*," "*surren*," "*sausen*," and "*brausen*"![8] All we have to do is look up chains of words. In the German/French section of the same dictionary, "*brummen*" is translated as "*bourdonner*, *grommeler*, *grogner*, *maugréer*, *bougonner*, *murmurer*."[9] These are some of the examples given: "*Die Fliegen brummen*" (the flies buzz); "*Die Glocke brummt*" (the bell rings—does this word imply a more collective act of listening to the bell?); and "*Der Kreisel brummt*" (the top whirs). The list of examples, however, is strongly weighted to vocal references. "*Summen*" would be "*bourdonner*, *ronfler* [to buzz; to snore, hum, or roar]": "*Die Mücken, die Bienen summen*" (the mosquitos or bees buzz); "*Es summt mir in den Ohren*" (I've got a buzzing in the ears). "*Schwirren*" would be "*siffler*, *bruire*, *frémir*, *bourdonner* [to whistle, rustle, shudder, buzz]." For example: "*Der Pfeil schwirrt durch die Luft*" (the arrow whistles through the

air); "*Die Lerche schwirrt*" (the lark zeets);[10] and "*Mir schwirrt der Kopf* (my head is spinning). "*Surren*" would be "*ronfler*, *vrombrir* [snore, hum, roar; to hum]," as in "*Die Kugel surren*" (the bullets whistle; there is a contradiction here between the example and the translation). "*Sausen*" yields "*siffler* [whistle]" and "*filer à grande vitesse* [to head off at high speed]," as in "*Der Wind saust*" (the wind whistles) or "*Es saust mir in den Ohren*" (my ears are buzzing—or are they rather whistling?). This little trip through a dictionary can encourage a relativism even greater than at the outset. It would seem in fact to suggest a host of possible sensation clusters of a total arbitrariness. For me, these discrepancies are constructive. Above all, we must not try to evade them, but rather cleave as closely as possible to these nuances and contradictions. In any case, we must not conclude either that the Germanophone ear is totally different than the Francophone one—and what of bilingual ears?—or that all of this is nothing but random groupings.

Don't think either that a dictionary in a given language necessarily provides for each of its words, the usage of which can be fairly precise, a satisfying definition. Simply take the word "*grésillement* [sizzling, crackling]." The *Petit Robert* dictionary from 1984 gives as its definition "light crackling" and as reference an example from Colette—"the *grésillement* of the sand . . . that rained finely against the walls"—and as more rare usage the sound of a cricket. Yet the characteristic sound of an electrical *grésillement*, which is today quite common, or of flies against a windowpane could not be defined as a "lighter" form of crackling (the adjective being highly ambiguous in this instance). With crackling, the attack of the component impulses is harder and drier—the intensity onset is more abrupt—than with a *grésillement*. As for the verb "*grésiller*" (defined as "to produce a rapid and rather weak crackling"), the example provided is closer to what we would usually associate with the word: "the omelet sizzled [*grésillait*] in the pan" (Maurice Genevoix). But obviously, while the phrase is clear for the majority of readers who possess a solid familiarity with French, very few among them—I am tempted to even say none—makes active use of this verb in everyday life.

On the other hand, among these words relating to certain phenomena and activities, there are some that we associate quite rarely with sound sensations and yet are nonetheless apt. Take the substantive "*grouillement* [swarming]," for example, which denotes the state of that which swarms, that is to say, that which "starting from numerous elements, moves and stirs in a confused mass." Here is a term that applies quite well to certain sonic states. In our

descriptions, we can thus integrate nouns that apply to states as long as we make sure to verify that they actually apply to the sound and not only to its "cause." A swarming mass of humans might not produce a swarming sound; its sound might be solid and fused. What we hear is, in fact, a function not only of the multiplicity of causes but also of the acoustical properties of the place as well as our listening position. Just as, visually speaking, a swarming throng of individuals in a train station only produces a swarming image if seen from a certain angle and in a certain light, sound recorded in a train station can be fused and homogenized by the peculiar resonance of large glass roofs. It is exactly for this reason that Robert Bresson in certain scenes of his films in which the backdrop is collective space such as the lobby of a train station (*Pickpocket* [1959]) or a big-city sidewalk (*Le diable probablement* [*The Devil, Probably*; 1977]) redoes the sounds in the studio by superimposing punctual sound effects, which when densely mixed produce a veritable sonic swarming that is very different from what we hear in reality.

Certain substantives such as "scraping" or "rubbing" can likewise lead to objections, since it might be said that the word "scraping" denotes someone or something that scrapes and "rubbing" someone or something that rubs. Haven't we relinquished the first rule of reduced listening and returned to the cause? Not necessarily, since when we recognize that a certain specific sound form is associated with a certain type of causality, we can state that we are dealing with the sound level and no longer with the cause level. A certain type of causal activity produces a certain type of sound, and the latter becomes a typical sound schema, detached from the cause. Thus the model of sonic ebb and flow is obviously given to us from nature and, in our day and age, for the not insignificant number of those who have never seen and heard the sea, by film and television (without counting music, which transcribes it). This schema becomes an emphatic, standardized sonic schema that exists independently of the evocation that it produces. No matter what does the rubbing, we have the sonic schema of rubbing: toing and froing, irregularities, presence of materializing sound indices, grain. The proof is that when we have subjects listen to certain sound processes without visual identification or preliminary verbal indications (in the mode of acousmatic and unidentified listening), they will say: "I don't know what is happening or what it is, but it's a rubbing sound."

When working on what listening to sounds is about and in so doing combing through existing words in a number of languages worldwide, we

must certainly not expect that, miraculously, each sound will find its word and that each word for its part will denote a very precise and localizable sonic phenomenon. It would be naive to expect a one-to-one correspondence between the two corpuses or to hope to end up with a closed and complete system. This is not the goal, which is rather to try to cleave as closely as possible to what we hear by means of words, while leaving a share to approximation as well as to shifts and effects of the linguistic signifier (which gradually structures perception). It is a matter of cultivating the most precise linguistic approximation. In this way, perception and language are simultaneously enriched and a culture can be born.

Obstacles to Naming and Describing

It is always instructive to attack the problems of naming and of description at the same time, and it is to this end that I have come to have my students watch brief film extracts several times over and to ask them subsequently for an oral or written report of what they have heard. Let's take as our research material a set of essays written by students at a professional film school who were asked in this context, as a control test, to describe a sequence from Jacques Tati's *Playtime* (1967). The setting of this sequence is the beginning of a very long corridor, which we are looking down, in a modern building. Hulot is in the foreground of the shot, to the left, accompanied by an elderly doorman, and he is awaiting a man whom we can see arriving from far off and who little by little gets closer to us from the back of the screen. The footsteps of this man, whose name is Giffard, have a sharp, determined sound and a regular rhythm. Next, Giffard shows Hulot into a waiting room made entirely of glass panes that looks onto the street. Outside we see the traffic circulation of a modern city: cars driving past at moderate speeds. There is no sound of horns, screeching tires, or slamming doors. It is a sort of peaceful ebb and flow that John Cage might have found enjoyable and represents a fine example of what the latter would have deemed "silence."

Idle, Hulot pushes on the seats of the vinyl chairs and watches them swell back up and recover their original shape. This activity causes pneumatic noises that are vaguely unseemly. The fact that sometimes a seat makes a noise as it recovers its shape and *sometimes does not* adds to the comic aspect. From time to time, Hulot is shot from the street, and we see him through the glass walls, without hearing what has intrigued him on the inside. A little while later, another man, dressed in a suit and hat and carrying a briefcase,

is shown into the waiting room. As soon as his sits down, he begins to fidget as if he doesn't have a moment to spare. He says not a word and pays no attention to Hulot, who stares at him insistently. He signs papers, brushes off his trousers with the palm of his hand, and clears his respiratory passages with a shot of nasal spray. During this entire sequence, we hear, whenever we are viewing from inside the building, both in the hallway and in the waiting room, two long and unvarying tonic notes that alternate between two proximate pitches and that are somewhat evocative, in their abstractness, of an electric buzzing of unknown origin.

One of the difficulties of trying to describe this sequence in the traditional psychological terms—which are in this instance inadequate—is that Hulot expresses with his gestures and much less with his face—which is, as ever, closed, inexpressive, and viewed from afar—not a single affect of impatience, irritation, or curiosity. This is something we see often with Tati, and it unsettles the usual, predictable analyses. While correcting a hundred or so assignments, I have uncovered in this research material a number of frequent causes of error, of perceptual or linguistic ticks—and often both at once—that block listening. I will list them not as a collection of blunders but rather as matter for reflection. Moreover, I am convinced that a group of adults and professionals would have produced the same responses. They provide an occasion to recall that all conditioning by whatever technique is for the most part a deconditioning. This is true whether we are talking about playing the piano—where you must free yourself of the reflex to move both hands to the same rhythm—or about writing and thinking, where we must chase off the clichés that crowd us. Here are ten traps of observation and naming:

1. *The reflex that consists in deducing what is heard from what is bound to be heard given what is seen*. In three-quarters of the assignments, we read that the sound of Giffard's advancing footsteps increases in intensity at a constant rate of growth in accord with the fact that we see him moving toward us with a mechanical pace: "The intensity of the sound of footsteps grows in exact proportion to the forward motion of the character." Yet, it is enough to listen without preconceived notions to note that the intensity of the sound sometimes increases, sometimes decreases, and is sometimes at a standstill. Because this is not "logical" (see below), most are not able to hear it, and this in spite of listening to the extracted sequence four times.

(above and opposite) *Playtime* (dir. Jacques Tati; 1967)

2. *The difficulty of disconnecting aspects of sound that are usually automatically associated.* Just as an ascending melody is not necessarily accompanied by a parallel increase in intensity—whereas we do have a tendency to associate these two aspects, especially when spontaneously singing to ourselves—in this case the regular rhythm of the footsteps incites the belief that the increase in intensity in these steps is itself perfectly linear, which is not the case. Tati has endowed the sound with a curve in intensity that is not isomorphic with the movement of the character. He thus puts into practice what I have called *sonic decoupling*.
3. *Blanking out or forgetting a component deemed too obvious or banal.* In the course of the sequence, the doorman and Giffard speak a few brief words. Recall that what was asked for was an exhaustive account of *all the sounds*, and yet a good number of students neglected to talk about these instances of dialogue because their artistic education—false in this regard—taught them that there are "banal" components—unworthy of interest—and "peculiar" components. As far as observation goes, however, it is all one.
4. *Personification of "sound" and "image" components, the relation of which is translated in terms of "power relations."* When a student writes that the "sound and image are united" or that they are perfectly "married," such terms lead us to believe that they might be "separated" or "divorced," which is not the case and shows that the added-value effect is at work. Saying that the image of someone walking and the sound of his footsteps are "married" has no more descriptive value than saying someone's voice and physique harmonize, and with good reason, since generally we come to know them together. Or else, with a louder noise, it is said to "crush" or "dominate," which is used to indicate the "domination" of one person over another.
5. *Linguistic automatisms, or the treacherous recourse to stereotypical and common epithets.* For example, the sound of cars heard driving past outside is termed *animated* because of the habit of associating this adjective with a street ambience, whereas in the extract from Tati it is, as I mentioned, calm, level, and continuous. Others thought it was a good idea to embroider their composition on the nature of the sound by writing about the "deafening din," and so forth. The words came to them automatically, linked to one another.

Here an intimacy with writers who avoid stereotypical formulas is invaluable.

6. *Absolute judgments about the "effects" of sounds.* A noise that intrigues because of the enigma of its provenance (the electrical buzzing) is often mentioned in the assignments as "irritating," "aggressive," "unpleasant," and, indeed, "very unpleasant." For whom, though? In which dramatic or psychological context? Under what listening conditions? Was the student too close to the loudspeaker?
7. *"Psychologizing" interpretations of the relation of characters to sounds.* Hulot is "attacked" or at least, according to another student, "bothered" by the sounds, whereas he appears at most, judging from his visible behavior, intrigued or even interested. The notion of an attitude of idly curious and dispassionate observation occurred to none of these writers. Or the two monotonous pitches, the one higher and the other lower, would have served to "characterize the opposed personalities of Hulot and Giffard," whereas they differ only in pitch, and their manifestation is not especially correlated to one or the other character.
8. *"Because-itudes."* I call "because-itudes [*parcequ'ismes*]" logical reasoning drawn from reality and not adapted to that artistic construction of a film. "Because-itudes" almost always lead observation astray by wanting to apply logical causality to the presence of a sonic phenomenon. For example, one assignment states, "We don't hear the doorman's words because the crackling"—the writer is referring to the electrical buzzing—"prevents us from hearing them." It is as if someone said about a horror film that we don't see the monster because the penumbra prevents us from seeing it. But nobody writes such a thing because we understand that darkness or an implied off-camera presence is a directorial choice. It is the same when somebody opines that, in a film, a sound that we do not hear is inaudible *because* it is "drowned out" by another. One of the assignments that I graded stretches this to an astounding "there is no silence since the buzzing drowns it out." In fact, the only reason that we do not hear it is because Tati did not put it in. The principle of mixing actually enables us to trump the natural laws of masking and to make heard in a street scene the sound of a footstep and a general rumbling at the same time. There is a certain sheepishness—as if it perhaps is an

admission of stupidity—about writing: "I see this and I hear this," without looking for the logical connection. Here, once again, the Japanese haiku, which chases away "becauses," provides an education in observation.

9. *Tendency to "hyperbolize" the description*. A cutaway affecting both sound and image, even if there is no pronounced contrast in intensity, is said to be "violent." An unusual sound is characterized as "very unpleasant." The greater sonic presence of one character in relation to another—of the busy client in relation to Hulot—conjures the term "overwhelming." We find ourselves witnesses to an epidemic of hyperbolic words—all the more striking in relation to a sequence based on hints and restraint—and this goes for stating the contrary as well. For example, to express that there is little in the way of dialogue, one student writes, "The voice is not omnipresent"! There must be reasons for this. It is not Tati's aesthetic; his contrasts are unobtrusive. It is due perhaps to two things: on the one hand, the attentional effort expended by the observer to hear a sound in the midst of others and to separate it from them might make it appear stronger than it is in reality; on the other, this might be a testimony to the impossibility for the writers of referring to a precise scale and limits. These limits, not being clearly inscribed within the frame of what is heard, are only in fact grasped at the end of an apprenticeship in listening. As opposed to sound, images actually suggest cutoff points in space and time that serve to frame objects. I mean by this that if a character approaches the camera or moves to the edge of the frame, we know that this will come to an end the moment that he or she fills in, saturates, or leaves the field—the space that preexists the character. As we have seen, there is for sound no preexisting sonic frame. This is notably so in the sense of a consciousness of reachable limits of intensity, such that a sound that increases in intensity has no boundary level or cutoff point. While increasing, it seems to create its very own field, which grows along with it.
10. *The difficulty in taking the conditions of listening and effects of context into consideration*. The observer often forgets to take into account the fact that the intensity level of the sound has been raised for the ease of perception, that listening rarely takes place in a soundproofed space, and that the reverberations created by the listening space are often attributed to the sounds.

We can reduce the different obstacles to sonic observation—obstacles that I have uncovered in the course of numerous such exercises—to five principal traps:

i. *The image or context trap*: thinking that one hears what is seen or what the context seems to indicate; forgetting to take into consideration the conditions of observation.
ii. *The trap of perceptual linkage*: linking distinct sonic criteria or, more generally, distinct perceptual (auditory as well as visual) criteria.
iii. *The logic trap*: applying a logic that is irrelevant to the fabricated and imaginary world of film; saying, "I heard that because logically I ought to hear it."
iv. *The word trap*: automatic associations of words or of ideas; seeking out words with which one can create associations of a literary sort or joke around.
v. *The ideological-affective trap*: interpreting in terms of binaries such as negative/positive, pleasant/unpleasant, good/bad, and so forth.

The only way to progress is to build up observational experiences while trying not to cheat in terms of linguistic honesty. In cases where word usage comes into contention, the dictionary serves as arbiter, even if it means taking note of, in certain cases and for certain words, imprecisions in given dictionaries or differences in definitions between two reference works. In France in particular, the way in which advertising sets the example of a constantly ambiguous manipulation of words to make the different significations glitter hardly encourages such linguistic honesty. It is true that this is not its role and that it would suffice if those whose role it is—namely, intellectuals—to make words retain their meanings were to provide the necessary counterbalance. . . .

Between Doing and Listening: Naming

The cycle of doing/hearing/describing seems to me one of the best procedures for educating one's perception. To this end, I have perfected an exercise, already tested in several schools and from which I have drawn various lessons.[11]

First, I introduced the students to Schaeffer's principle of reduced listening and had them undertake group practice on ready-made sounds by

providing them with the most basic criteria of classification and description. Second, they were given several hours to "create" and to affix onto a medium three sounds corresponding to simple typological definitions and within a reasonable range of durations (less than thirty seconds per sound). For example: an X′ (complex impulse), a high-pitched sound with grain, and a Y″ (variable iterative sound).

All sound sources are allowed: acoustic or synthetic musical instrument, everyday object, and so forth. Beforehand, I will have demonstrated vocally or, better still, with simple objects how one can produce the entire family of nine basic sounds of Schaeffer's typology—tonic sounds, of course, but also complex ones. For example, you can use your mouth to create a prolonged "ch," a complex sound with either continuous or iterative sustain, and you can roughly control the site (position in the pitch range) and caliber (thickness). The student is given a few hours to produce the three required sounds, which he or she subsequently presents, in front of his peers and the teaching team, during an evaluation session at which everyone is present. After presenting them for hearing without commentary, he or she must then describe them and is helped along with questions: Do they correspond to what was intended? What characteristic details do they have in addition to the required specifications? This linguistic analysis by the person in charge of a sound produced to order counts as much toward the grade as the proper execution of the sound. Such analysis alone allows us to know whether a concept such as "tonic sound" has been intelligently understood. This circuit from listening (without creating sounds) to the fabrication of sounds and then to verbal explanation strikes me as essential.

The obligation to name the sounds that one has "made" is particularly helpful for becoming aware of the traps of ergo-audition and of causalism. For example, a student might think to produce a tonic sound by using a string from a musical instrument (from a guitar or violin) or perhaps a complex one by using an everyday object (a metal can or cardboard box) based on the stereotyped identifications often made between instruments and notes and "trivial" objects and noises. And yet, a certain precise action carried out with a guitar string will turn out to have produced a sound with complex mass and, conversely, the trivial object (a piece of wood or a cooking utensil) will have rung out a note. It is then much more important to know how to hear the sound that one has produced and fixed than to have "mastered" the production of the sound with an object as per order. Chance

may have it, in fact, that the sound obtained does not correspond—or not entirely—to what had been specified, which is not a problem as long as one is aware of what has happened. But if the student is not able to perceive what he or she has created, this is much more problematic.

In addition, the student might have intended to produce an impulse by impacting an object with a quick gesture, but the sound body uncooperatively carries on resonating and the sound produced ends up being a continuous percussion-resonance. Someone who focuses on the matter of gestural mastery—the idea that sounds ought to obey my conscious willing—will refuse to hear that the sound might be something other than a reflection of intent and will be inclined to minimize the "unwanted" resonance.

Here is a third example of the causal trap at work, and one where putting the analysis in words can make for better listening: a student has been instructed to make an iterative sound; for this purpose, she logically employs a furrowed object, made up of ridges or grooves that are equidistant and close together: electric heater, grille, grating, or some such, that is scraped with a mallet, stick, pen, or the like. If the object is scraped very quickly, the sound ceases to be iterative and becomes a continuous sound with grain. Once again, a *quantitative* change in the speed of the gesture has led to a *qualitative* leap from discontinuity into continuity.

This exercise, if it is carefully monitored, also leads to spotting and calling into question conventional correlations. For example, students for whom the assignment is to produce a sound with grain have an instinctive tendency to endow it with "complex" mass, and they will make complex scrapings or rubbings. Since grain means for them a noisy character, they associate it in a stereotyped manner with sounds that are supposed to have this character themselves because they are complex, whereas there exist numerous instances of tonic sounds, musical or not—squealing brakes, flutter-tongued notes on a flute, and especially, violin tremolo, which is the most prevalent example—that have grain. During this exercise, I never miss stressing to the creator of a sound of the sort that he or she perhaps conceived the sound because of automatic associations (between "grain" and "nonmusical" sound) and that undoing these reflexive associations might enable the creation of more varied sounds. Whence the interest, moreover, in ordering up sounds in which only one, two, or three criteria are specified, the choice of other criteria being left to imagination, to invention, or to chance. If one were to straightaway provide an exhaustive description, the opportunity to reflect on stereotypes of the sort would not arise.

Here is another example: a student decides to produce a tonic sound object by recording himself whistling a note. Relistening to his whistle affixed to a medium, he does not hear that, along with the tonic note, a large portion of the sound was made up of a "breath" (a complex sound) that was not a part of his conscious intent and that was the result of the stream of air escaping through his lips and that the microphone had captured. Furthermore, a student will often have a stereotyped prior representation, linked to the average distance at which it is normally heard, of a sound that he himself produces. When he whistles and records this in sonic close-up, he does not hear that close miking modifies the balance of the sound's components and actually makes new features appear that are inaudible from a certain distance. What is at stake here is not a sound carried out and heard "in itself," but a captured and fixed sound.

This is an exercise without any aesthetic aim; nor is it, as is currently said, "ludic." It is clear, however, that we must not try to take away the element of pleasure that comes from making sounds. When, as a composer of musique concrète, I undertake "sound shoots," there is inevitably physical pleasure and a sort of audio-phonatory loop between the sounds that I emit and what I hear that enables me to make sounds in a vital fashion and that involves a fuzziness in my listening. But subsequently, if I listen to these sounds again to turn them into material for a composition for a recorded medium, I must listen lucidly to what is fixed and now disconnected from the ergo-auditory context. An instrumentalist can certainly come to hear himself or herself live but to get to this point will have needed many years of experience with the same sound source and will have had a professor with whose ear he will have identified (if I may put it thus). Certain instruments demand a very critical ear. Violinists, to take a notable example, must inevitably verify by ear what they do, since the notes are not pretuned with keys. But always, with material sources the possibilities of which one is unfamiliar, a new apprenticeship is needed, and the best musician becomes a beginner all over. Finally, the difficulty and spice of the exercise inheres in the challenge of listening to sounds one at a time—of hearing particular sounds and not a standard model.

In everyday reality, we are obliged in fact to shape for ourselves with respect to certain sounds that are repetitive or cyclical in nature—such as cars passing by on the street—an average, statistical model, of which each sound is a particular version. But when we observe a fixed sound in the mode of reduced listening, we must free it from a global image type—free it from a multitude of images that are superimposed on it and that are all sonic

species of the same form and that conform to the same model. For example, we are hardly in the habit of attending with interest to a passing car taken in isolation—attending to this passing by and to no other—and we start from the fact that all such transits are similar since they conform to the same model of a continuous gradient of change. It's as if one were to say that all peak shapes, when seen from the valley, are similar. There are some that are conical, some that are jagged, and so forth.

Listening Is Acting

We live with the notion that perception is a passive thing, the mechanisms of which are acquired once and for all as we pass out of infancy.[12] Whereas we pass a good part of our lives in building up our affective balance and in enriching our intellectual capacities, we are satisfied with a perceptive capacity frozen at a very modest stage of structuration. For us, eyes and ears are simply just holes through which visual and sonic images pass into our brains. This implicit scorn for the perceptual function is contradicted by every scientific study. Researchers such as von Békésy have shown that, when it comes to the sense of hearing, there are, beginning from the psychological level, phenomena of "intelligent listening."[13] If our listening capacity is already intelligent at its most basic functioning, we might think that it could be even more so. But what use to us would a more intelligent listening capacity be?

I do not label "intelligent listening" those specialized forms of listening that everyone has in relation to a certain domain. Thus some can recognize a car's model from its sound, just as a piano tuner can spot an instrument's correctness down to the tittle. What I am talking about is a more general structuring of perception. What happens if our perception of things is sharpened? Our relation to the world is changed. The information that we receive and which is the matter with which we fashion our opinions and thoughts is richer and more diversified. Is what is at stake with a trained perception to lift the veil of illusion and to see reality behind the appearances? Not so much as that, but simply to become aware of our "perceiving body" and to resituate it, more vigilant and more active, in that ocean of messages in which it is tossed. It's of no use to pit well-meaning intellectual theories against that audiovisual flood, of which the greatest part functions as either explicit propaganda (advertising, politics) or implicit propaganda (ideologies conveyed by works of fiction). Advertising makes a mockery of our intellectual consent. It plays on other levels of our person—on those of

the motor centers of our behavior: affectivity and unconscious drives. But it acts on them as long as we do not attend to the perceptual windows of our body, and this means our eyes and ears.

Shouldn't we begin by acquiring the means to mentally control our perception? And this would not at all take place through some moral discipline or bookish ideological dismantling, but rather through an active and disinterested exercise of our perceptual capacities, one attentive to distinguishing levels and to spotting illusions. Don't we need to rediscover what observation means and engage in *object lessons*? It is just that observation, which is a sort of meditation, is a pretty undervalued activity. Or else, when it is practiced, this is often done in a very unrefined manner. Ideological analyses of the content of audiovisual messages, currently practiced, are botched and ineffectual. Made up of prior assumptions and recipes—and inspired at bottom by a certain scorn for the perceptual given—they pass off as scientific rigor their implacable systematism, which is the worst sort of intellectual laziness. As for true observation—*attention to things*—it is not taken seriously. The flavor du jour, for example, tends to consider as worthy only those expressions of the "public" that bear witness to a grand and muscular activity: shouting, actions, and participation of the sort. But it is a mistake to think that stirring more is acting more. Unrest is the commonest form of inaction. One can act much more while seeming to do nothing. What I have said about perception in general applies in particular to the sense of listening, which is the sense most under attack today—and yet the least trained and thus the least defended. We must learn to listen, for listening is acting.

Notes

Introduction

1 See in particular Claudia Gorbman's translations of various of Chion's works on film: *Audio-Vision: Sound on Screen* (New York: Columbia University Press, 1994); *The Voice in Cinema* (New York: Columbia University Press, 1999); and *Film, a Sound Art* (New York: Columbia University Press, 2009). Chion's writings on various musical genres—symphonic, programmatic, concrete, and so forth—are many, although not as well represented in translation. On the whole, I have respected earlier translations of key terms in Chion's oeuvre in order to simplify cross referencing and—simply and thankfully—because they are elegant and accurate.

2 See R. Murray Schafer, *The Soundscape: Our Sonic Environment and the Tuning of the World* (Rochester, VT: Destiny Books, 1994). This was originally published as *The Tuning of the World* (New York: Knopf, 1977).

3 While Boulez was early on a fellow traveler in Schaeffer's musical experiments, the subsequent relationship of the GRM and IRCAM (founded in 1971) might best be described as chilly rivalry, with the latter accusing musique concrète of a chaotic lack of compositional method and the former remarking an apparent lack of concern for listeners and their capacities. On IRCAM, see Georgina Born's remarkable anthropological analysis *Rationalizing Culture: IRCAM, Boulez, and the Institutionalization of the Musical Avant-Garde* (Berkeley: University of California Press, 1995), with accounts of the dismissive and at times derisory attitude to musique concrète on pages 97 and 168.

4 Pierre Schaeffer, *In Search of a Concrete Music*, trans. Christine North and John Dack (Berkeley: University of California Press, 2012), 23. This work was originally published in 1952.

5 Chion himself has provided the most extended study of Henry and his compositions in his *Pierre Henry* (Paris: Fayard, 2003 [revised and enlarged from the original 1980 edition]). The author discusses *Messe pour le temps présent* on pages 110–12 and *Ceremony* on pages 129–34.

6 Pierre Schaeffer discusses the "acousmatic" in his *Traité des objets musicaux: Essai interdisciplines* (Paris: Seuil, 1966), 91–97. Chion's derived notion of the *acousmêtre* is central to his *Voice in Cinema* and reappears more briefly in *Audio-Vision* (127–31). For an extended examination of the "acousmatic" and its history, see Brian Kane, *Sound Unseen: Acousmatic Sound in Theory and Practice* (New York: Oxford University Press, 2014).

7 Kane examines in detail the mythical and foundational status of the Pythagorian "curtain" or "veil" in Schaeffer's writings and in various subsequent—and prior—accounts of acousmatic listening and acousmatic sounds in *Sound Unseen* (45–72).

8 On the seminal role of the medium for Schaeffer, see John Dack, "Pierre Schaeffer and the Significance of Radiophonic Art," *Contemporary Music Review* 10, no. 2 (1994): 3–11.

9 Scholars have in recent years questioned Schaeffer's thesis—put forward in various ways by other earlier thinkers as well—that would treat radio as fundamentally a-visual or of separating sound and vision. See, for example, Neil Verma's analysis of radio dramas and the ways in which they have been (incorrectly) conceptualized in his *Theater of the Mind: Imagination, Aesthetics, and American Radio Drama* (Chicago: University of Chicago Press, 2012). See also Susan J. Douglas's analyses of radio, visuals, and imagination in her *Listening In: Radio and the American Imagination* (Minneapolis: University of Minnesota Press, 2004), especially 22–39.

10 Similarly, listening to the mid-twentieth century's pioneers of electronic music, we sense deep affinities with the visual and the sense of *rendering* visuality. Many pieces sound like soundtracks to films, and some of them were. They sound quite different from symphonic music, which can be visually evocative but generally aimed at listening in itself, or from dance music—from waltzes and minuets to the throb of contemporary club forms—that links up to proprioception and bodily movement. This is music that readily acts as ancillary to the visual—the ethereal glissando of the theremin abetting alien imagery, or beeps and buzzes evoking future technologies—or that, listened to by and for itself, is nonetheless supplemented and quickened by imagination.

11 Schaeffer, *In Search of a Concrete Music*, 24.

12 Schaeffer does not appear to have suffered the near phobia that afflicted another, slightly earlier conjurer of what I have called the radiophonic scene. Writing in 1932, Theodor Adorno would evoke how "the expropriation of the upper middle class through inflation and other crises has expelled this stratum

of society from opera and concerts, exiling its members before the radio, the distraction of which adequately expresses the atomization of the bourgeoisie and the exclusion of the bourgeois private person from public affairs," who sits "in front of the loudspeaker," simultaneously subordinated to economic and musical monopoly ("The Social Situation of Music," in Theodor Adorno, *Essays on Music*, ed. Richard Leppert, trans. by Susan H. Gillespie et al. [Berkeley: University of California Press, 2002], 418).

13 As with radio, the supposed self-evidence of the notion that certain media separate sound and vision whereas others do not has been thoroughly examined and greatly complicated in sound studies scholarship over the past decade or so. For a thorough historical analysis, see Jonathan Sterne, *The Audible Past: Cultural Origins of Sound Reproduction* (Durham, NC: Duke University Press, 2003), especially 215–77. Clearly, listening to radios and phonographs can involve a variety of visual concomitants, and the same holds for more recent technologies (see, for example, Michael Bull, "The Audio-Visual iPod," in *The Sound Studies Reader*, ed. Jonathan Sterne [London: Routledge, 2012], 197–208).

14 A strand of sonic thinking that has been extended in the philosophy of Don Ihde (see *Listening and Voice: Phenomenologies of Sound*, 2nd ed. [Albany: State University of New York Press, 2007]).

15 See Schaeffer, *Traité des objets musicaux*, 261–74. Schaeffer's phenomenological tendencies are marked and have not gone unnoticed or unanalyzed. See, for example, the brief introduction to the excerpt on "acousmatics" from Schaeffer's *Traité des objets musicaux* in Christoph Cox and Daniel Warner, eds., *Audio Culture: Readings in Modern Music* (New York: Continuum, 2010), 76; Frances Dyson's overview of Schaeffer and musique concrète in her *Sounding New Media: Immersion and Embodiment in the Arts and Culture* (Berkeley: University of California Press, 2009), 55–58; Joanna Demers's historical and philosophical account of Schaeffer, reduced listening, and the "locked groove" in her *Listening through the Noise: The Aesthetics of Experimental Electronic Music* (Oxford: Oxford University Press, 2010), 27–29 in particular; and Kane's careful analysis of Schaeffer's Husserlian moves and commitments in *Sound Unseen* (15–41).

16 Ian Hacking, *The Social Construction of What?* (Cambridge, MA: Harvard University Press, 1999), 19.

17 See Pierre Bourdieu, *Distinction: A Social Critique of the Judgement of Taste*, trans. Richard Nice (Cambridge, MA: Harvard University Press, 1984).

18 Given Schaeffer's own apparently shifting usage of *allure* from the inception of his project to his later systematic typology and morphology of sound objects, the translators of his *In Search of Concrete Music* opted not to translate the term (xiii).

19 Schaeffer, *Traité des objets musicaux* (556); Chion, *Guide to Sound Objects*, trans. John Dack and Christine North (2009), 178.

20 Schaeffer, *In Search of Concrete Music*, 25.

21 Chion is hardly alone in questioning the limitations of notation and examining others ways of getting sounds across, so to speak. See, for example, John Mowitt, *Percussion: Drumming, Beating, Striking* (Durham, NC: Duke University Press, 2002), especially 23, 40, 68, 109, and 211; and Christopher Small, *Musicking: The Meanings of Performing and Listening* (Middletown, CT: Wesleyan University Press, 1998), in particular his discussion of notation, "nonliterate" performance, and improvisation in the Western classical tradition on 110–19.

22 See Jacques Derrida, *Voice and Phenomenon*, trans. Leonard Lawlor (Chicago: Northwestern University Press, 2010), 60–74.

23 Derrida coined and developed this term in *Specters of Marx: The State of the Debt, the Work of Mourning and the New International* (New York: Routledge, 2006 [first published in French in 1993]). On the coinage, see pages 9 and 63. "Hauntology" has enjoyed a perhaps surprising currency among cutting-edge music enthusiasts and critics thanks in large part to Simon Reynold's adoption and adaptation of the term to describe the use of sampling in pop music in particular (see Reynolds, *Retromania: Pop Culture's Addiction to Its Own Past* [New York: Faber and Faber, 2011], 311–61). Kindred are David Toop's reflections on the trope of sound in uncanny fiction "as an unstable or provisional event, ambiguously situated somewhere between psychological delusion, verifiable scientific phenomenon, and a visitation of spectral forces" (*Sinister Resonance: The Mediumship of the Listener* [New York: Continuum, 2010], 130).

24 Probably the most infamous attack on theory came from Alan Sokal and Jean Bricmont in their *Fashionable Nonsense: Postmodern Intellectuals' Abuse of Science* (New York: Picador, 1998), although theirs is hardly the only one, and many were launched by former theory "insiders." On the reception of "theory" in the North American academy, see, among others, François Cusset, *French Theory: How Foucault, Derrida, Deleuze, & Co. Transformed the Intellectual Life of the United States*, trans. Jeff Fort (Minneapolis: University of Minnesota Press, 2008).

25 See, for example, Mladen Dolar's citation of Chion in his Lacanian ruminations in *A Voice and Nothing More* (Cambridge, MA: MIT Press, 2006), 60ff. Consonantly, Chion cites Dolar with approbation in the present volume.

26 See François Bayle, *Musique acousmatique: propositions . . . . . positions*, introduction by Michel Chion (Paris: Institut National de l'Audiovisuel and Éditions Buchet/Chastel, 1993), 79–99 and 186.

27 See Theodor Adorno, *Essays on Music*, 118, 306.

28 See, for example, Paul Hegarty, *Noise/Music: A History* (New York: Continuum, 2007), and Salomé Voegelin, *Listening to Noise and Silence: Towards a Philosophy of Sound Art* (New York: Continuum, 2010). The Adornian strand is followed,

for example, in Ben Watson, *Derek Bailey and the Story of Free Improvisation* (London: Verso, 2004). The "noise as violence" thesis is closely related to notions of depictions of visual violence and certain sexual practices as shattering subjectivity. In queer theory, see Leo Bersani, *The Freudian Body: Psychoanalysis and Art* (New York: Columbia University Press, 1989); or for film studies, Steven Shaviro's praise of horror in *The Cinematic Body* (Minneapolis: University of Minnesota Press, 1993). This is a tiny selection from a much longer list. It is worth noting that the oft-cited father of noise music has recently been given a thorough historical reappraisal by Luciano Chessa, who has criticized the avant-garde appropriation of his subject, in his study *Luigi Russolo, Futurist: Noise, Visual Arts, and the Occult* (Berkeley: University of California Press, 2012). As Chessa writes: "Many scholars familiar with Russolo's late writings consider them to indicate a departure in his thinking; some have been quick to follow Adorno and label them regressive, arguing that by abandoning the technologically inspired modernity of futurism for esoteric gymnastics, Russolo had de facto 'abdicated'—as one Hegelian critic put it—from following the 'spirit of the avant-garde' " (2). Chessa has meanwhile reconstructed Russolo's *intonarumori*, or "noise sounders," composing for them and touring them in what might be called historically informed performance of twentieth-century avant-garde music rather than the more usual Baroque and early music targets.

29 See my translation of Chion's essay "Let's Do Away with the Notion of Noise," in *The Sense of Sound*, eds. Rey Chow and James A. Steintrager, a special issue of *differences: A Journal of Feminist Cultural Studies* 22, nos. 2–3 (2011): 240–48. Chion elaborates his case against noise, conceptually and linguistically speaking, in chapter 5 of this study.

30 I borrow this term from Mark Poster, *The Mode of Information: Poststructuralism and Social Context* (Chicago: University of Chicago Press, 1990).

31 The shattering of the unities of hermeneutic subjectivity with the coming of new media and their purported historical division of the sensorium and psyche along Lacanian lines is the overarching argument of Kittler's *Gramophone, Film, Typewriter*, trans. Geoffrey Winthrop-Young and Michael Wutz (Stanford, CA: Stanford University Press, 1999). A somewhat rhapsodic condensation of the argument goes: "Paper and body, writing and soul fall apart. Typewriters do not store individuals; their letters do not communicate a beyond that perfectly alphabetized readers can subsequently hallucinate as meaning. Everything that has been taken over by technological media since Edison's inventions disappears from typescripts. The dream of a real visible or audible world arising from words has come to an end. The historical synchronicity of cinema, phonography, and typewriting separated optical, acoustic, and written data flows, thereby rendering them autonomous" (14).

32 Cultural constructivism, for example, looms particularly large in the field of ethnomusicology. See, among others, the pioneering work of Steven Feld in his *Sound and Sentiment: Birds, Weeping, Poetics, and Song in Kaluli Expression*, 3rd ed. rev. (Durham, NC: Duke University Press, 2003), as well as works such as Louise Meintjes's *Sound of Africa: Making Music Zulu in a South African Studio* (Durham, NC: Duke University Press, 2003).

Chapter 1. Listening Awakes

1 Homer, *Iliad*, trans. Robert Fagles (New York: Penguin, 1998), 100.
2 Victor Hugo, "Fenêtres ouvertes. Le matin.—En dormant," in *Œuvres complètes*, vol. 6, *Poésie III* (Paris: Robert Laffont, 1985), 726–27.
3 Along with evoking Walt Disney's famous film *Fantasia*, Chion makes oblique reference to Pierre Boulez's composition *Le marteau sans maître* [The masterless hammer] (1954), which sets to music René Char's surrealist poem of the same name (1934). [Trans.]
4 Leonardo da Vinci, *The Notebooks of Leonardo da Vinci*, trans. and ed. Edward MacCurdy (New York: Georges Braziller, 1955), 264.
5 R. Murray Schafer, *The Soundscape: Our Sonic Environment and the Tuning of the World* (Rochester, VT: Destiny Books, 1994), 272. The French translation of *The Soundscape* from which the author quotes does not follow the original exactly, and I have consequently cited Schafer's glossary definition of "keynote," which neatly sums up the term and captures Chion's concerns. I might further remark that the French translation of the portmanteau "soundscape" is simply *paysage sonore*, i.e., "sonic landscape." "Keynote" is translated as *tonalité*, which likewise diminishes the pithiness and force of the original. [Trans.]
6 Schafer, *The Soundscape*, 10. For "signal" the problem mentioned above for "keynote" of an inexact fit between the French translation and the English edition also obtains, and I have again cited the passage from Schafer's original that most closely matches Chion's intent and concerns. [Trans.]
7 Victor Hugo, *Œuvres complètes*, vol. 5, *Poésie II* (Paris: Robert Laffont, 1985), 586.
8 This line will be found in Virgil, *Eclogues, Georgics, Aeneid 1–6*, trans. G. P. Goold (Cambridge, MA: Harvard University Press, 1999), 268. The English translation is mine, in order to respect the author's rendering of the line. [Trans.]
9 Marcel Proust, *In Search of Lost Time, Volume I: Swann's Way*, trans. C. K. Scott-Moncrieff and Terence Kilmartin, revised by D. J. Enright (New York: Modern Library, 2003), 43.
10 Alphonse de Lamartine, "Novissima Verba," in *Harmonies poétiques et religieuses*, in *Œuvres poétiques complètes* (Paris: Gallimard, 1963), 486.

11 Stendhal, *The Charterhouse of Parma*, trans. John Sturrock (London: Penguin, 2006), 47. Stendhal explains that *mortaretti*, or "little mortars," are sawn-off gun barrels that are filled with gunpowder, set into the ground, linked by a line of powder, and then set off like firecrackers. In this case, they accompany the Festival of Saint Giovita by Lake Como. [Trans.]

12 Stendhal, *The Charterhouse of Parma*, 47.

13 Paul Valéry, *Poèmes et Petits poèmes abstraits, Poésie, Ego Scriptor* (Paris: Gallimard, 1992), 13.

14 The entire text of Kafka's "Grosser Lärm" runs: "I sit in my room in the noise headquarters of the entire residence. I hear all the doors slamming. Thereby am I spared only the noise of footsteps running between them, yet still I hear the snapping shut of the stove doors in the kitchen. Father bursts asunder the doors of my room and marches through in his dangling nightgown. Out of the oven in the neighboring room the ashes are scraped. Valli asks, each word shouted through the anteroom, whether father's hat has already been cleaned. A hiss, which hopes to befriend me, then raises the outcry of an answering voice. The doors of the flat unlatch and creak, like a catarrhal throat, then keep on opening with the singing of a woman's voice, and finally close with a thudding, manly tug, sounding utterly inconsiderate. Father has left. Now begin the gentler, more distracted, more hopeless noises, marked by the voices of two canaries. Already earlier I had thought about it, and now with the two canaries I consider afresh, whether I ought not open the door a crack, slither snakily into the adjoining room and thus from the floor beg my sisters and their mistress for quiet." Translated from the German by J. Steintrager; original in Franz Kafka, *Sämtliche Erzählungen*, ed. Paul Raabe (Frankfurt am Main: Fischer Taschenbuch Verlag, 1970), 194–95.

15 For more on this film and its deployment of identificatory effects of overhearing someone being talked about, see Michel Chion, *Film, a Sound Art*, trans. Claudia Gorbman (New York: Columbia University Press, 2009), 302–5.

16 Françoise Dolto, *L'image inconsciente du corps* (Paris: Seuil, 1984), 43.

17 Françoise Dolto, *Au jeu du désir* (Paris: Seuil, 1981), 284. The notion that smell is repressed as part of the process of education and civilization has a long history in psychoanalytic thinking. For an overview, see Annick Le Guérer, "Olfaction and Cognition: A Philosophical and Psychoanalytic View," in *Olfaction, Taste, and Cognition*, ed. Catherine Rouby, Benoist Schaal, Danièle Dubois, Rémi Gervais, and A. Holley (Cambridge: Cambridge University Press, 2002), 3–15. [Trans.]

18 Jacques Ninio, *L'empreinte des sens* (Paris: Odile Jacob, 1989), 248–49. Ninio remarks that babies cannot simply imitate the sounds around them—and notably a father's voice—because they cannot reproduce the relatively lower pitches. An

infant must thus transpose to a higher register in its imitations; a hypothetical corollary is that pitch itself is treated by the infant as a "secondary given" (which provides information, for example, about a speaker's identity) in relation to the more complex sonic forms that are subject to imitation such as attack and sustain (see Ninio, 148–49). On the other hand, adults speaking to babies will automatically transpose their speech up an octave or so (baby talk). This transposition appears quite welcomed by the infant and aids in the imitation of sounds and learning of language. On transposition, baby talk, and speech acquisition, see Adolf Heschl, *The Intelligent Genome: On the Origin of the Human Mind by Mutation and Selection*, trans. Albert Edward Fulford (Berlin: Springer, 1998), 166–68. [Trans.]

19 See Marie-Agnès Faure, *L'esprit des voix* (Grenoble: La Pensée sauvage, 1990), 35.

20 Roman Jakobson, "The Sound Laws of Child Language," in *Studies on Child Language and Aphasia* (The Hague: Mouton de Gruyter, 1971), 17. The author cites this passage from Jacques Derrida, *De la grammatologie* (Paris: Éditions de Minuit, 1967), 444.

Chapter 2. The Ear

1 Lionel Marchetti, *Haut-parleur, voix et miroir* (Lyon: Môme ludies, 2010), 19.

2 Claude Bailblé, "De l'oreille en plus, 2e partie," *L'Audiophile* 50 (November 1989): 140.

3 Bailblé, "De l'oreille en plus," 140.

4 Yves Galifret, "Acoustique physiologique," in *Encyclopædia Universalis: Corpus*, ed. Jacques Bersani et al., vol. 1 (Paris: Encyclopædia Universalis, 1989), 199.

5 The reference is to Hermann von Helmholtz's *On the Sensations of Tone as a Physiological Basis for the Theory of Music*, although the citation is from Jean-Jacques Matras, *Le son* (Paris: Presses universitaires de France, 1967), 38.

6 On the telephone theory of hearing, see Matras, *Le son*, 38–39.

7 On Wever and the volley theory, see Matras, *Le son*, 40.

8 This is a compressed account of the history of hearing theory. John E. Roeckelein in his *Dictionary of Theories, Laws, and Concepts in Psychology* (Westport, CT: Greenwood Press, 1998) usefully outlines five historical theories (see 61–62). [Trans.]

9 Bailblé, "Programmation de l'écoute (4)," *Cahiers du cinéma* 299 (April 1979), 17.

10 Bailblé, "Programmation de l'écoute (4)," 17.

11 The "mel scale" was first proposed by S. S. Stevens, J. Volkmann, and E. B. Newman in "A Scale for the Measurement of the Psychological Magnitude Pitch," *Journal of the Acoustical Society of America* 8 (January 1937): 185–90. It was specifically devised as a "subjective scale" to complement and supplement "the musical scale and frequency scale, neither of which is subjective" (185). [Trans.]

12 Jacqueline Adler, Josiane Jouet, Émile Noël, and Pierre Tarday, *L'homme d'aujourd'hui dans la société sonore* (Paris: INA, 1978), 54.
13 Adler et al., *L'homme d'aujourd'hui dans la société sonore*, 54–55.
14 Adler et al., *L'homme d'aujourd'hui dans la société sonore*, 57.
15 Chion makes an untranslatable pun at this point: to prick up one's ears in French is *tendre l'oreille*, literally to "stretch the ear." The verb *tendre* is derived from the same Latin verb that gives us the noun *tensor* as in the "tensor tympani" (literally, "drum stretcher" or "drum tightener") muscle subsequently invoked. One might say that localized hearing involves flexing one's ear muscles. [Trans.]
16 Bailblé, "De l'oreille en plus," 140.
17 Bailblé, "De l'oreille en plus," 143 (emphasis in the original).

Chapter 3. Sound and Time

The haiku is by Ikenishi Gonsui, whom the author cites from Gaston Renondeau, trans., *Anthologie de la poésie japonaise classique*: "Le rude vent d'hiver/s'est apaisé / Ne laissant que le bruit des flots" (Paris: Gallimard, 1978), 225.

1 Stéphane Mallarmé, *Œuvres complètes*, vol. 1 (Paris: Gallimard, 1998), 483.
2 Mallarmé, *Œuvres complètes*, 484, 485.
3 Mallarmé, *Œuvres complètes*, 487.
4 Mallarmé, *Œuvres complètes*, 131 (emphasis added; from "Sonnet allégorique de lui-même").
5 All citations from François Rabelais, *Œuvres complètes*, 2 vols. (Paris: Garnier Frères, 1962), 2.206–207.
6 I have not attempted to translate Rabelais's rendering of the sounds released on the deck of the ship. In Chion's account, these sounds are simultaneously designated as speech by the use of feminine constructions that imply the likewise feminine noun *paroles* and as noises by the use of masculine constructions that imply the masculine noun *bruits* (a distinction lost in English). [Trans.]
7 Rainer Maria Rilke, *Duino Elegies: Bilingual Edition*, trans. Edward Snow (New York: North Point Press, 2000), 62–63 (translation modified).
8 I have translated the author's citation of Porphyry from the French (Jean-Paul Dumont, ed., *Les écoles présocratiques* [Paris: Gallimard, 1991], 460). The observation is made in Porphyry's commentary on Ptolemy's *Harmonics*, rendered by one translator into English: "Hearing is not like sight, which sends the vision out to the object and receives the apprehension of the object back in exchange . . . ; rather, as Democritus says, it is a receptacle of words, which awaits the sound like a container. The sound penetrates and flows in, which is why sight is swifter than hearing. For though lightning and thunder occur

simultaneously, we see the former as it happens, but do not hear the latter at all or only some time afterwards; the reason for this is simply that our vision meets the light, whereas the thunder arrives at our hearing, which receives it." C. C. W. Taylor, trans. and commentary, *The Atomists: Leucippus and Democritus. Fragments* (Toronto: University of Toronto Press, 1999), 121. [Trans.]

9 Again, I have translated from the French version that the author has used, namely, Lucretius, *De natura rerum*, vol. 2, bilingual edition, trans. Alfred Ernout (Paris: Les Belles Lettres, 1964), 16. For an English version with Latin text, see Lucretius, *On the Nature of Things*, trans. W. H. D. Rouse and revised by Martin Ferguson Smith (Cambridge, MA: Harvard University Press, 1992), 505. [Trans.]

10 See Michel Chion, *La symphonie à l'époque romantique: De Beethoven à Mahler* (Paris: Fayard, 1994).

11 Jacques Ninio, *L'empreinte des sen* (Paris: Odile Jacob, 1989), 242.

12 See Jacques Lacan, "Seminar on 'The Purloined Letter,'" in *Écrits*, trans. Bruce Fink in collaboration with Héloïse Fink and Russell Grigg (New York: Norton, 2006): 6–48. The idiom that I have rendered "staring right at us" is *crèver les yeux*, which literally means to burst or puncture the eyes but is employed figuratively to indicate something—to use an aptly Oedipal expression—blindingly obvious. [Trans.]

13 André Gide, *Les nourritures terrestres*, in *Romans* (Paris: Gallimard, 1958), 223.

14 Alphonse de Lamartine, from "Première Vision" in *La chute d'un ange*, in *Œuvres poétiques complètes* (Paris: Gallimard, 1963), 826.

15 See Robert Francès, *The Perception of Music*, trans. W. Jay Dowling (Hillsdale, NJ: Lawrence Erlbaum Associates, 1988).

16 I have provided a straightforward translation of the author's *temps-frise*. It is worth noting, however, that the English term "timeline" is in French *frise chronologique*, that is, "chronological frieze." [Trans.]

Chapter 4. Voice, Language, and Sounds

1 Ferdinand de Saussure, *Course in General Linguistics*, trans. Wade Baskin (New York: Columbia University Press, 2011), 118–19 (translation modified). The original citation will be found in Ferdinand de Saussure, *Cours de linguistique générale* (Paris: Payot, 1983), 164.

2 Jean Dubois, Mathée Giacomo, Louis Guespin, Christiane Marcellesi, Jean-Baptiste Marcellesi, and Jean-Pierre Mével, *Dictionnaire de linguistique* (Paris: Larousse, 1973), 373–75.

3 Roman Jakobson, *Six Lectures on Sound and Meaning*, trans. John Mepham (Hassocks, UK: Harvester Press, 1978), 10.

4 Jakobson, *Six Lectures*, 12.

5 Jakobson, *Six Lectures*, 12. Antoine de Jussieu, whom Jakobson incorrectly cites as Jussien, published his report "Sur la manière dont une 'Fille sans Langue' s'acquitte des fonctions qui dépendent de cet organe" in the *Mémoires de l'Académie royale des sciences* (January 15, 1718). [Trans.]

6 Jakobson, *Six Lectures*, 13. Moreover, with a bit of training, anyone can reproduce this finding.

7 Dubois et al., *Dictionnaire de linguistique*, 446 (emphasis added).

8 Mladen Dolar, "The Object Voice," in *Gaze and Voice as Love Objects*, ed. Renata Salecl and Slavoj Žižek (Durham, NC: Duke University Press, 1996), 10.

9 Dolar, "The Object Voice," 9–10.

10 Transcribed from the film *Écoute*, dir. Miroslav Sebestik (1992).

11 See Michel Chion, *The Voice in Cinema*, trans Claudia Gorbman (New York: Columbia University Press, 1999), 83–85.

12 From the poem "Chanson d'automne" (part of the collection *Poèmes saturniens*) in Paul Verlaine, *Œuvres complètes*, vol. 1 (Paris: Messein, 1953), 29.

13 Verlaine, *Œuvres complètes*, vol. 1, 155. From the poem "Charleroi" (part of the collection *Romance san paroles*).

14 Lucretius, *De rerum natura*, trans. W. H. D. Rouse, revised by Martin Ferguson Smith (Cambridge, MA: Harvard University Press, 1992), 317 (bilingual edition).

15 Lucretius, *De rerum natura*, 318–19 (translation modified).

16 Alfred Döblin, *Gespräche mit Kalypso: Über die Musik* (Olten: Walter-Verlag, 1980), 33. In keeping with the author's later recommendation of bilingual sound journeys, I would note that in the original German Döblin has the little stones "*klirren und lärmen*." [Trans.]

17 See 2 Corinthians 3.6: ". . . for the letter killeth, but the spirit giveth life." [Trans.]

18 René Ghil, *Traité du verbe*, with a preface by Stéphane Mallarmé (Paris: Giraud, 1886), 6.

19 As with the first examples mentioned above, English makes use of similar juxtapositions. As the next examples show, however, these similarities between English and French onomatopoeias by no means obviate the author's point that different languages handle imitative sound words in different ways and have different phonetic resources to do so. [Trans.]

20 See Charles Nodier, *Dictionnaire raisonné des onomatopées françaises* (Paris: Demonville, 1808).

21 Stéphane Mallarmé, *Œuvres complètes*, vol. 2 (Paris: Gallimard, 1998), 208. These lines come from "Crise de vers [Poetic crisis]." The "keys" in question are those of a piano or suchlike instrument. I have noted that "bearing" is *allure*, an important term for both Chion and Pierre Schaeffer. In Mallarmé's assessment, *jour*, that is, "day," would have a sonically dark coloration or bearing and *nuit*, that is "night," would ring ironically clear. [Trans.]

22 See Mallarmé, *Œuvres complètes*, 2:1001–4.
23 See Gérard Genette, *Mimologies: Voyage en Cratylie* (Paris: Seuil, 1976). Translated into English as *Mimologics* by Thais E. Morgan (Lincoln: University of Nebraska Press, 1995).
24 See Ivan Fónagy, *La vive voix: Essais de psycho-phonétique* (Paris: Payot, 1983), 74–76.
25 Plato, *Protagoras, Euthydème, Gorgias, Ménexène, Ménon, Cratyle*, (Paris: Garner-Flammarion, 1967), 465. For Socrates's discussion of the sounds of consonants and convention in both Greek and English, see Plato, *Cratylus, Parmenides, Greater Hippias, Lesser Hippias*, trans. Harold N. Fowler (Cambridge, MA: Harvard University Press, 1977), 170–75.
26 See Jakobson, *Six Lectures*, 31.

Chapter 5. Noise and Music: A Legitimate Distinction?

1 Gottfried Wilhelm Leibniz, *Opera Mathematica*, in *Opera Omnium (1768)*, vol. 3, ed. L. Dutens (Hirschberg: Georg Olms, 1989), 437.
2 The citation is apparently from an essay by Jacques Atlan entitled "Philosophie de la musique I: Les nombres et les gammes," currently unattainable. [Trans.]
3 Nonrepresentational visual art is not a recent development. Consider, for example, the so-called decorative motifs in Arabic art, which follow from the Koran's ban on imitation.
4 This definition is taken from *Le petit Robert: Dictionnaire de la langue française*: "Ce qui, dans ce qui est perçu par l'ouïe, n'est pas senti comme son musical; phénomène acoustique dû à la superposition des vibrations diverse non harmoniques" (Paris: Société du Nouveau Littré, 1970), 199.
5 *Le petit Robert*, 199.
6 Jacques Attali, *Bruits: Essai sur l'économie politique de la musique* (Paris: Presses universitaires de France, 1977 [revised, enlarged, and republished in 2003]). The English edition is *Noise: The Political Economy of Music*, trans. Brian Massumi (Minneapolis: University of Minnesota Press, 1985).
7 The Schaefferian typology, including what is meant by "complex impulses," notated as X′, is explained at greater length in chapter 11. [Trans.]
8 "*. . . du sonore musicalement quadrillé.*" Something that is *quadrillé* is literally divided up into squares—that is, put on graph paper—but figuratively the term can mean to put someone under surveillance, a resonance that seems relevant in this instance. [Trans.]
9 Chion here makes reference to an aphorism from Blaise Pascal that has passed into proverbial usage in French: "L'homme n'est ni ange, ni bête, et le malheur veut que qui veut faire l'ange fait la bête [Man is neither angel nor beast, and

unfortunately whoever would play the angel plays the beast]" (*Pensées* [Paris: Gallimard, 1977], 370). [Trans.]

10 Jules Verne, *Paris au XXe siècle* (Paris: Le Livre de poche, 2002), 60.

11 André Gide, *Journals*, vol. 3 (1928–1939), trans. Justin O'Brien (Champaign: University of Illinois Press, 2000), 9. The journal entry is from February 28, 1928.

12 This according to a usage of the term "noise" the historical dialectic of which I have analyzed in my book *La musique concrète, art des sons fixés* (Lyon: Mômeludies, 2009).

13 Étienne Bonnot de Condillac, *Traité des sensations* (Paris: Fayard, 1984), 58. Originally published in 1784. [Trans.]

14 Luigi Russolo, *The Art of Noises*, trans. Barclay Brown (New York: Pendragon Press, 1986), 24 (translation modified), 36.

15 Russolo, *Art of Noises*, 26.

16 Russolo, *Art of Noises*, 26–27 (translation modified).

17 Russolo, *Art of Noises*, 27 (emphasis added).

18 See Michel Chion, *Le poème symphonique et la musique à programme* (Paris: Fayard, 1993), the last chapter in particular.

19 This Warner Bros. production starring John Barrymore in the title role was the first feature-length film to have a soundtrack using Vitaphone, a film sound system that synchronized a separate phonograph recording to the film stock. For *Don Juan*, there was no dialogue, but musical accompaniment and sound effects. Vitaphone was, however, the technology used as well for the first "talkie," *The Jazz Singer*. [Trans.]

20 See Michel Chion, *La musique au cinéma* (Paris: Fayard, 1995), 160–61.

21 The French figurative expression that Chion uses here is *tomber sur un os*, literally, "to fall on a bone." [Trans.]

22 I have told this story in *La musique au cinéma* and in *Film, a Sound Art*, trans. Claudia Gorbman (New York: Columbia University Press, 2009).

23 See Michel Chion, *La comédie musicale* (Paris: Cahiers du cinéma, 2002).

24 Maurice Bardèche and Robert Brasillach, *Histoire du cinéma*, vol. 1 (Paris: Livre de poche, 1964), 406.

Chapter 6. The Sound That You Cause

1 See Jean-Louis Leutrat, "Les arnaqueurs: Des étoiles sur le trottoir," *Positif* 420 (February 1996): 101. This essay considers Stephen Frear's *The Grifters* (1990), known as *Les arnaqueurs* in French. [Trans.]

2 Tati's film is considered at greater length in chapter 12 of this work.

3 Denis Diderot, *Lettre sur les aveugles à l'usage de ceux qui voient*, in *Œuvres*, ed. André Billy (Paris: Gallimard, 1989), 867.

4 See Jacques Derrida, *Voice and Phenomenon*, trans. Leonard Lawlor (Chicago: Northwestern University Press, 2010).
5 See Didier Anzieu, "L'enveloppe sonore du soi," *Nouvelle Revue de Psychanalyse* 13 (1976): 161–80.
6 Theocritus, *Idylls*, trans. Anthony Verity (London: Oxford University Press, 2002), 25.
7 Claudel, "La muraille intérieure de Tokyô," in *Milles et cent ans de poésie française*, ed. Bernand Delvaille (Paris: Robert Laffont, 1991), 1271.
8 Heraclitus, *Heraclitus: Fragments*, ed. T. M. Robinson (Toronto: University of Toronto Press, 1987), 55.

Chapter 7. Sound and Its Cause

1 Marcel Proust, *In Search of Lost Time, Volume I: Swann's Way*, trans. C. K. Scott-Moncrieff and Terence Kilmartin, revised by D. J. Enright (New York: Modern Library, 2003), 16 [translation modified].
2 Paul Verlaine, *Œuvres complètes*, vol. 1 (Paris: Messein, 1953), 255.
3 In the original, Hacker is cited in Roberto Casati and Jérôme Dokic, *La philosophie du son* (Nîmes: Jacqueline Chambon, 1994), 52. This is not an exact citation, although what Hacker says on the topic is close: "Sounds . . . are not three-dimensional objects, for they are not objects and have no height, length, or breadth. Unlike colours, but like light, they may fill a space, as when we say that the sound of the orchestra filled the concert hall (and that the hall was flooded with light), but they do not fill a space as a pint of beer may fill a tankard, for unlike quantities of liquid, they do not take up space" (P. M. S. Hacker, *Appearance and Reality: A Philosophical Investigation into Perception and Perceptual Qualities* [Oxford: Basil Blackwell, 1987], 102).
4 Casati and Dokic, *La philosophie du son*, 52.
5 Denis Vasse, *L'ombilic et la voix* (Paris: Seuil, 1974).
6 Étienne Bonnot de Condillac, *Traité des sensations* (Paris: Fayard, 1984), 164.
7 Claude Bailblé, citation untraced.
8 Maurice Pradines, *La fonction perceptive* (Paris: Denoël/Gonthier, 1981), 173.
9 Pierre Schaeffer, *Traité des objets musicaux: Essai interdisciplines* (Paris: Seuil, 1966), 161.
10 Stéphane Mallarmé, *Œuvres complètes*, vol. 1 (Paris: Gallimard, 1998), 430.
11 Sohrab Sepehri, from the poem "A Sun" in the collection *Green Mass*, here cited from *A Selection of Poems from the Eight Books*, trans. Bahiyeh Afnan Shahid (Bloomington: Balboa Press, 2013), 132.
12 Franz Kafka, *Œuvres complètes*, vol. 3 (Paris: Gallimard, 1984), 725.

13 Euripides, *Hippolyte*, in *Théâtre*, vol. 2 (Paris: Les Belles Lettres, 1965), 51. I have translated these lines from the French. The original Greek will be found in Euripides, *Children of Heracles. Hippolytus. Andromache. Hercules*, trans. David Kovacs (Cambridge, MA: Harvard University Press, 1995), 180–181, along with an English translation: "I hear a voice, but I do not hear its message clearly. Utter aloud to me what kind of cry it is that comes to you through the door." [Trans.]

14 In French the author contrasts regular genitive constructions such as "son de piano," "son de chien" and "bruit de machine" with his idiosyncratic usage recommendation: "son-piano," "son-chien," and "son-machine." [Trans.]

15 The seventeen syllables of Bashō's poem have been translated many times and in many ways. I have opted here to stick close to the French translation used by the author. [Trans.]

16 Stephen McAdams and Emmanuel Bigand, eds., *Penser les sons: Psychologie cognitive de l'audition* (Paris: Presses universitaires de France, 1994), 190.

17 McAdams and Bigand, *Penser les sons*, 190. The original reference is Daniel J. Freed, "Auditory Correlates of Perceived Mallet Hardness for a Set of Recorded Percussive Sound Events," *Journal of the Acoustical Society of America* 87 (1990): 311–22.

18 R. Murray Schafer, *The Soundscape: Our Sonic Environment and the Tuning of the World* (Rochester, VT: Destiny Books, 1994), 91 (emphasis added).

19 On this point, see the appendix, entitled "Techniques <<analogiques>> en musique concrète ['Analogical' techniques in musique concrète]," of my study *La musique concrète, art des sons fixés* (Lyon: Moméludies éditions, 2009), 126–59.

Chapter 8. Sound and What It Causes

1 Victor Hugo, *Œuvres complètes*, vol. 5, *Poésies II* (Paris: Robert Laffont, 1985), 171. These lines are from the first poem ("Sonnez, sonnez toujours . . .") of book 7 of the collection *Châtiments* (1853).

2 See my study *Le poème symphonique et la musique à programme* (Paris: Fayard, 1993).

3 François Rabelais, *Œuvres complètes*, 2 vols. (Paris: Garnier Frères, 1962), 2.285–86.

4 See Michel Chion, *The Voice in Cinema*, trans. Claudia Gorbman (New York: Columbia University Press, 1999).

5 See, in this regard, Michel Chion, *Audio-Vision: Sound on Screen*, trans. Claudia Gorbman (New York: Columbia University Press, 1994), and *Film, a Sound Art*, trans. Claudia Gorbman (New York: Columbia University Press, 2009).

6 Rabelais, *Œuvres complètes*, 1.472.

7 From the Greek word for "noise" (*thorubos*) and the privative prefix *a-*. [Trans.]
8 See Michel Chion, *Le promeneur écoutant: Essais d'acoulogie* (Paris: Plume, 1993).
9 Jean-Paul Dumont, ed., *Les écoles présocratiques* (Paris: Gallimard, 1991), 630. I have translated above from the French. The original Greek, along with an English translation, will be found in Plutarch, *Moralia, Volume IX: Table-Talk, Books 7–9. Dialogue on Love*, trans. Edwin L. Minar Jr., F. H. Sandbach, and W. C. Helmbold (Cambridge, MA: Harvard University Press, 1961), 138–139. [Trans.]
10 In the final lines of Canto X of *Paradise* (11. 145–48), the poet says, ". . . so now I saw that wheel / rendering voice to voice in harmony, / and in sweet temper that no man can feel / If not where joy is for eternity [così vid'io la gloriosa rota / muoversi e render voce a voce in tempra / e in dolcezza ch'esser non pò nota / se non colà dove gioir s'insempra]" (*Paradise*, trans. Anthony Esolen [New York: Modern Library, 2007], 108–9). [Trans.]
11 On "trance music," see Gilbert Rouget's study *La musique et la transe* (Paris: Gallimard, 1980).
12 Alfred Döblin, *Gespräche mit Kalypso: Über die Musik* (Olten: Walter-Verlag, 1980), 27–28. In the original, Döblin uses the term *Ding*, cognate with English "thing," which the French translation renders *objet*, that is, "object." [Trans.]

Chapter 9. How Technology Has Changed Sound

1 The poem that Eiffel recited was Jean Rameau's "L'Acacia" (see Alphonse Lemerre, ed., *Anthologie des poètes français du XIXe siècle* [Paris: Alphonse Lemerre, 1887], 188). The recording itself is part of the Bibliothèque Nationale de France's holdings of phonographic cylinders from Eiffel's private collection of recordings. [Trans.]
2 R. Murray Schafer, *The Soundscape: Our Sonic Environment and the Tuning of the World* (Rochester, VT: Destiny Books, 1994), 60.
3 See Michel Chion, *Le promeneur écoutant: Essais d'acoulogie* (Paris: Plume, 1993).
4 See Glenn Gould, "The Prospects of Recording," in *The Glenn Gould Reader*, ed. Tim Page (New York: Knopf, 1984), 331–53.
5 I first put the term forward in a work that has since been revised and republished under the title *La musique concrète, art des sons fixés* (Lyon: Mômeludies, 2009).
6 On Springer's *Zeitregler* and related devices, see Curtis Roads, *Microsound* (Cambridge, MA: MIT Press, 2004), 61–62. [Trans.]
7 André Abraham Moles, "L' image sonore du monde environnant. Phonographies et Paysages Sonores," in *Paysage Sonore Urbain*, ed. Elisabeth Scheer (Paris: Plan Construction, 1981), 271
8 Gould, "The Prospects of Recording," 334.

9 As I have already examined in both *Audio-Vision: Sound on Screen*, trans. Claudia Gorbman (New York: Columbia University Press, 1994), 98–99, and *Film, a Sound Art*, trans. Claudia Gorbman (New York: Columbia University Press, 2009), 117–36.

10 See Michel Chion, *La symphonie à l'époque romantique: De Beethoven à Mahler* (Paris: Fayard, 1983), 186.

11 Béla Balázs, *Le cinéma: Nature et évolution d'un art nouveau* (Paris: Payot, 1979), 206–7. Balázs, né Herbert Bauer, wrote both screenplays and film criticism; his work *Filmkultúra* (published in Hungarian, translated into French with title above and into English by Edith Bone as *Theory of the Film: Character and Growth of a New Art* [1952]), was originally published in 1948. [Trans.]

12 Alan Williams, "Is Sound Recording Like a Language?," *Yale French Studies* 60 (1980): 53.

13 Rick Altman, "The Material Heterogeneity of Recorded Sound," in *Sound Theory, Sound Practice*, ed. Rick Altman (New York: Routledge, 1992), 29.

14 For Bayle a sound-image [*image-de-son*], which he abbreviates *i-son*, necessarily connotes mediation or the transcription of a sound onto a given material platform and, as a consequence, such a sound becomes pregnant with *significance*. As Bayle glosses the concept: "For sight the image is defined based on the trace on a receptive medium [*support sensible*] of luminous energy coming from an object. The i-sound is likewise defined for hearing by an apparition isomorphic to the sonic source (that is to say, transmitted identically via the air to the auditory system)

But like the image, the i-sound is distinguished from the source-sound by a double disjunction. On the one hand, there is the physical disjunction produced by a substitution in the space of causes; on the other, there is the psychological one, produced by a displacement in the field of effects: consciousness of a simulacrum, of an interpretation, of a sign" (François Bayle, *Musique acousmatique: propositions . . . . . positions* [Paris: Institut National de l'Audiovisuel and Éditions Buchet/Chastel, 1993], 186). [Trans.]

Chapter 10. The Audiovisual Couple in Film

1 Élisabeth Dumaurier, *Psychologie expérimentale de la perception* (Paris: Presses universitaires de France, 1992), 112.

2 I would refer the reader here to my numerous works on the subject for a detailed demonstration of this thesis, for which the exceptions are few. See, among others, *Audio-Vision: Sound on Screen*, trans. Claudia Gorbman (New York: Columbia University Press, 1994), and *Film, a Sound Art*, trans. Claudia Gorbman (New York: Columbia University Press, 2009).

3 Chion, *L'audio-vision* (Paris: Nathan-University, 1990), 128. [For reasons of stylistic consistency, I have translated this passage from the French; see, however, *Audio-Vision*, 150 (trans.).]
4 In her translation of Chion's *Audio-Vision*, Claudia Gorbman renders the notion of *sons en creux* as "negative" or "phantom" sounds. *En creux* literally means "hollowed out" and here, as Gorbman remarks, the author is suggesting something along the lines of negative sonic space (see *Audio-Vision*, 214). In her translation of Chion's *Film, A Sound Art*, Gorbman has opted for "c/ommitted sounds" to translate the same (see 387–91 and the translator note on page 404). [Trans.]

Chapter 11. Object and Non-Object

1 *Solfège de l'objet sonore* in the original and the title given to recordings of exemplary sound objects that Schaeffer made with Guy Reibel to accompany the *Traité des objets musicaux*. [Trans.]
2 Michel Chion, *Guide to Sound Objects*, trans. John Dack and Christine North (2009), 32 (translation modified; pdf available for download at EARS: Electro-Acoustic Resource Site [www.ears.dmu.ak.edu]). Original citation from Michel Chion, *Guide des objets sonores: Pierre Schaeffer et la recherche musicale* (Paris: INA/Buchet-Chastel, 1983), 34.
3 Pierre Schaeffer, *Traité des objets musicaux: Essai interdisciplines* (Paris: Seuil, 1966), 269.
4 Chion, *Guide des objets sonores*, 149–50.
5 Moles was a visionary personality who, moreover, played a considerable part in the elaboration of Schaeffer's research on sound. On Moles and Schaeffer's project to map sounds in three dimensions, see Pierre Schaeffer, *In Search of Concrete Music*, trans. Christine North and John Dack (Berkeley: University of California Press, 2012), 191–221.
6 Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Donald A. Landes (New York: Routledge, 2012), 312.
7 From the section "Acoustique musicale," written by Charles Marie Gariel, in Albert Lavignac and Lionel de la Laurencie, eds., *Encyclopédie de la musique et dictionnaire du conservatoire,* pt. 2, vol. 1 (Paris: Delagrave, 1925), 405.
8 Gariel, "Acoustique Musicale," 405.
9 Roberto Casati and Jérôme Dokic, *La philosophie du son* (Nîmes: Éditions Jacqueline Chambon, 1994), 95.
10 I came across the term in the complete edition of the Littré dictionary. The word "verberation" does exist in dictionaries of the English language ("The impulse of a body; which causes sound" [*Webster's Revised Unabridged Dictionary*, 1996]), but the French *verbération* will not be found in the 2001 edition of the

Grand Robert dictionary (the most comprehensive of modern French dictionaries) or in the most recent editions of the Petit Larousse dictionary. The Grand Larousse dictionary of 1923 mentions it as "obsolete" and reproduces the definition, cited above, from the Littré.

11 S. S. Stevens and Fred Warshofsky, *Sound and Hearing* (New York: Time-Life Books, 1969), 9.

12 Schaeffer, *Traité des objets musicaux*, 160.

13 Schaeffer, *Traité des objets musicaux*, 161.

14 Döblin addresses the role of what he calls the "Königston" in *Gespräche mit Kalypso: Über die Musik* (Olten: Walter-Verlag, 1980), 55. [Trans.]

15 Robert Francès, *The Perception of Music*, trans. W. Jay Dowling (Hillsdale, NJ: Lawrence Erlbaum Associates, 1988), 193. I have translated Francès's term "*suraudition*" as "hyper-audition," which is rendered in Dowling's version "hearing out." For the original, see Robert Francès, *La perception de la musique* (Paris: Vrin, 1972), 217. [Trans.]

16 Francès, *La perception de la musique*, 218. For Dowling's translation, which I have not used here, see Francès, *Perception of Music*, 193.

17 Jean-Jacques Rousseau, *Essai sur l'origine des langues* (Paris: Gallimard, 1990), 130.

18 For a longer discussion of the "stress" and "articulation" pairing, see Chion, *Guide to Sound Objects*, 125–27. [Trans.]

19 Christian Metz, "Le perçu et le nommé," in *Essais sémiotiques* (Paris: Klincksieck, 1977), 155.

20 Metz, "Le perçu et le nommé," 156.

21 Metz, "Le perçu et le nommé," 156.

22 Michel Chion, *Le promeneur écoutant*: *Essais d'acoulogie* (Paris: Plume, 1993), 81.

23 Henri Piéron, *La sensation* (Paris: Presses universitaires de France, 1974), 32.

24 See the Alfred Tomatis, Jean-Paul Legouix, and Élisabeth Dumaurier debate in Élisabeth Dumaurier, ed., *Le pouvoir des sons*, from the series *Cahiers Recherche/Musique*, no. 6 (Paris: INA-GRM, 1978): 46–48.

25 Louis Bertrand Castel (1688–1757) was a Jesuit who published widely in mathematics and natural philosophy. He developed a so-called ocular harpsichord, an instrument that sufficiently intrigued Georg Philipp Telemann for him to compose pieces for it. [Trans.]

26 Rousseau, *Essai sur l'origine des langues*, 129–31.

27 Charles Baudelaire, *The Flowers of Evil*, ed. Marthiel Mathews and Jackson Mathews (New York: New Directions, 1989), 12 and 241–42. The second page number refers to the original French in this bilingual edition; the first to Richard Wilbur's translation of the poem. The translation above, however, is mine. The poem "Correspondances" has often been taken as programmatic for Baudelaire in laying forth a poetics of synesthesia. [Trans.]

28 Arthur Rimbaud, *Complete Works, Selected Letters*, trans. Walter Fowlie (Chicago: University of Chicago Press, 1966), 120–21. This is a bilingual edition for the poetry.
29 See Michel Chion, *La musique au cinéma* (Paris: Fayard, 1995).
30 Dante, *Paradise*, trans. Anthony Esolen (New York: Modern Library, 2007), 359. The last line of *The Divine Comedy*. [Trans.]
31 Roland de Candé, *Dictionnaire de musique* (Paris: Seuil, 1961), 31.

Chapter 12. Between Doing and Listening

1 We know that it is much more complicated than this, particularly with Japanese, but also with respect to forms of alphabetic writing, which are far from being "phonographic."
2 Rainer Maria Rilke, *Duino Elegies: Bilingual Edition*, trans. Edward Snow (New York: North Point Press, 2000), 18–19.
3 This is one of the aims of my *Livre des sons* [Book of sounds], which I began 1995 and is on its way to completion (as of 2010).
4 To be sure, as Michel Marie reminds me, the lexicon of a language is a set of relations, but at this stage, we are at a sort of inventory of naming possibilities. [Michel Marie is a professor of film studies at the Sorbonne Nouvelle and has written many works on cinema. He has collaborated with Jean Aumont on some well-known pedagogical works such as *L'analyse des films* (Paris: Armand Colin, 2004) and *Le dictionnaire théorique et critique du cinéma*, 2nd ed. (Paris: Armand Colin, 2008). He also oversees the book series Cinéma/Arts Visuels (published by Armand Colin) in which the revised edition of *Le Son*, translated here, appeared. (Trans.)]
5 See my analysis in chapter 1 of this study.
6 Antoine de Saint-Exupéry, *Courrier sud*, in *Œuvres* (Paris: Gallimard, 1953), 66.
7 Since the author is working between French and German, I have attempted in the translation to render both into English while capturing the various correspondences and not necessarily overlapping nuances. In other words, Chion's bilingual journey becomes a rather more complicated trilingual one. Hopefully, clarity has not been sacrificed to the necessary and heuristic muddle. [Trans.]
8 Rough English translations of these various terms yield: "*das Schwirren*" = buzzing or whirling; "*das Brummen*" = buzzing, growling, droning, humming, muttering; "*das Dröhnen*" = roaring, rumbling, booming; "*das Gesumme*" = humming, droning; "*das Gemurmel*" = murmuring, mumbling; "*brummen*" = to buzz, growl, drone, hum, grumble; "*summen*" = to hum, buzz; "*schwirren*" = to whiz, buzz; "*schnarren*" = to buzz, clatter, creak, croak; "*schnurren*" = to purr, hum, whir;

"*surren*" = to hum, whir, buzz; "*sausen*" = to buzz, whistle, roar, hurtle; and "*brausen*" = to roar, thunder, ring out, foam, pound, buzz [in the ears]. [Trans.]

9 Rough translations from the French yield, in order of appearance: to buzz, to mutter, to growl, to grumble, to grumble, and to whisper. [Trans.]

10 The French translation of *schwirren* in this instance is the rare verb *grisoler*, which specifically denotes the voice of the lark. The *Trésor de la langue française* speculates concerning the etymology that it may be onomatopoeic—thus my attempted rendering in English with "zeet," one of the many attempts to transcribe the lark's call—in this case the horned lark, the only North American native lark—for purposes of identification. [Trans.]

11 These schools include the École supérieure des études cinématographique (ESEC) in Paris and the Département audiovisuel de l'École cantonale d'art de Lausanne (ECAL-DAVI).

12 This text of this last subsection was written in 1971. I came across it close to forty years after having written it for a performance. I have only changed a few words, without tampering with the naïveté of its origins.

13 I have been unable to trace a specific reference to "intelligent listening" to Georg von Békésy's most celebrated work on sound and auditory science *Experiments in Hearing* (New York: McGraw-Hill, 1960) or elsewhere. [Trans.]

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Glossary

The reader will find a more complete glossary in a bilingual version (French and English) at the website www.michelchion.com. The website also includes a detailed bibliography of my writings on acoulogy, both books and essays. I would like to express my deep gratitude to Geoffroy Montel, who helped me create this site, and to Claudia Gorbman, who prepared the English translations for the website. My *Guide des objets sonores* has been translated into English by John Dack and Christine North with the title *Guide to Sound Objects*, and thanks to them—and I do thank them heartily—the latter is available online via several websites. In particular, it is available for download at the ElectroAcoustic Resource Site (EARS; http://ears.pierrecouprie.fr/).

Acousmatic (Pierre Schaeffer, 1952): Adjective specifying a listening situation in which one hears a sound without seeing its cause. It also specifies the sound heard under these conditions. Because cause is a contextual notion, the criteria for determining that a sound is perceived under acousmatic circumstances are as well.

Audio-Visiogenic Effects (Michel Chion, 1998): Effects created in films by associations of sounds and images. Because of the "added-value" effect, these are often projected onto and attributed to the image. These can be categorized as effects of meaning, of ambience, of content, of matter (see "materializing sound indices"), of rendering (producing sensations of energy, texture, speed, volume, temperature, etc.), as well as *scenographic* effects (which bear upon the construction of an imaginary space) and effects that bear upon time and the construction of temporal phrasing. See also "audio-vision."

Audio-Vision (Michel Chion, 1990): Perception particular to film and television, but also often experienced in everyday situations. With audio-vision, the image is

the conscious focus of attention, but sound contributes at every instant a number of effects, sensations, and significations that are often attributed to the image.

Auditory Window (Michel Chion, 1988): Context in which a vibration in the air or in water is able to produce an acoustic sensation localized in the ear. Such sensations can be treated as objects and as such are distinguished by the acoustic properties of pitch, mass, matter, and intensity, without necessarily being accompanied by corporeal covibrations.

Auditum (Michel Chion, 1998): The sound that is heard—as opposed to its real causes—when considered as an object of reduced or figurative listening.

Bisensoriality (Michel Chion, 1993): A sound can be thought of as bisensorial whenever it enters via the auditory window and simultaneously impinges on the body through covibration, which is the case for numerous audible phenomena.

Causal Listening (Pierre Schaeffer, 1967): Mode of listening that is concerned, via a given sound, with all those indices capable of informing the auditor about its cause. What object, phenomenon, or creature produced the sound? How does this object, phenomenon, or creature behave or move? And so forth.

Complex (Mass) (Pierre Schaeffer, 1967): A sound is said to have complex mass when it does not entail for the listener a recognizable and precise pitch. Compare "tonic."

Covibration (Michel Chion, 1998): Denotes the phenomena by which a part of our bodies vibrates "sympathetically" with a sound. This is particularly common with low frequencies and for certain frequencies of the voice (at the level of the larynx). Covibration concerns everything about a sound that impinges on the body, with the exception of the auditory window.

Decoupling (Acoustic) (Michel Chion, 1990): An effect enabled by sound technologies of recording, fixation, amplification, processing, and so forth, when they lead to isolating and making vary separately from one another aspects of a sound that in the "natural" acoustic world are correlated. It can also be produced through vocal and instrumental techniques.

Ergo-Audition (Michel Chion, 1993): Particular type of audition in which one is simultaneously, either wholly or partially, responsible for, whether consciously or not, the sound that is heard.

Figurative Listening (Michel Chion, 1993): Mode of listening that may appear identical to causal listening but that has to do not so much with what causes a sound in reality as with what the sound *represents*.

Fixed (Sound) (Michel Chion, 1988): Sound recorded onto an "analog" or "digital" medium. The choice of the term *fixed* rather than *recorded* stresses the fact that we have to do with a sound object that has been stabilized in terms of its texture, history, material substance, duration, and so forth, regardless of the fact that it is the result of an ephemeral event.

Impulse (Pierre Schaeffer, 1967): Sound that is sufficiently short that it appears, relative to our hearing scale, as a temporal point. One of the three types of *sustainment* (see also "iterative").

Iterative (Sound) (Pierre Schaeffer, 1967): Said of a sound the sustainment of which is characterized by the rapid repetition of short, distinct sounds—that is, of "impulses"—that produce something like a sonic dotted line.

Mass (Pierre Schaeffer, 1967): Way in which a sound inhabits the field of pitch. The three principal types of mass are complex, tonic, and variable.

Materializing Sound Indices (Michel Chion, 1990): Denotes aspects of a given sound that make felt more or less accurately the material nature of its source and the concrete history of its emission: its solid, gaseous, or liquid nature; its material consistency; the accidental features that arise during its unfolding; and so forth. The materializing sound indices of a sound can be greater or fewer in number and, in limited cases, a sound can have none.

Reduced Listening (Pierre Schaeffer, 1967): Mode of listening that deliberately and artificially abstracts from causes—and I would add from effects—and from meaning in order to attend to sound considered for itself and not only with regard to its sensible aspects of pitch and rhythm but also of grain, matter, shape, mass, and volume.

Sustainment (Pierre Schaeffer, 1967): Way in which a sound maintains itself or not over time. The three principal types of sustainment are impulse (no sustainment), continuous sustainment, and iterative sustainment.

Synchresis (Michel Chion, 1990): Term that I coined for a spontaneous and reflexive psychophysiological phenomenon, which is universal and anchored in our nervous connections. This phenomenon consists in perceiving the concomitance of a punctual sonic event and a punctual visual event as one and the same occurrence manifesting itself both visually and acoustically. It happens the moment that these two events are produced simultaneously, and this is its sole, both necessary and sufficient, condition.

Technological Effects, Basic (Michel Chion, 1994): Effects enabled by those machines that, starting from the end of the nineteenth century, have completely

changed the production, nature, and diffusion of sounds and, more particularly, of music. There are seven of these basic effects: capture, telephony, systematic acousmatization, phonofixation or fixation, amplification and deamplification, phonogeneration, and reshaping.

Tonic (Mass) (Pierre Schaeffer, 1967): A sound is said to have tonic mass when it entails for the listener a precise pitch, as opposed to sounds that are said to be complex or having complex mass.

Transsensorial (Perceptions) (Michel Chion, 1990): Those perceptions are transsensorial that belong to no one sense in particular but can borrow the channel of one sense or another without their contents and effect becoming enclosed within the limits of the borrowed sense. For example: everything having to do with rhythm, but also a certain number of spatial perceptions, as well as the dimension of language.

Verberation: According to the *Littré* dictionary: "An old term of physics. Vibration of air that produces sound" (taken up again *Grande Larousse Universel* dictionary of 1923, where it is deemed "obsolete"). The term *verberation* is still used in English, although rarely: "The impulse of a body, which causes sound." The word is not included in the *Grand Robert* dictionary nor in the *Petit Larousse* dictionary. I think that now is a good time to reintroduce it into circulation.

Visu-Audition (Michel Chion, 1990): Mirror image of audiovisual situation, the term *visu-audition* applies to a type of audiovisual perception consciously focused on the auditory and where audition is influenced by a *visual context* that can lead to projecting certain perceptions onto it.

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